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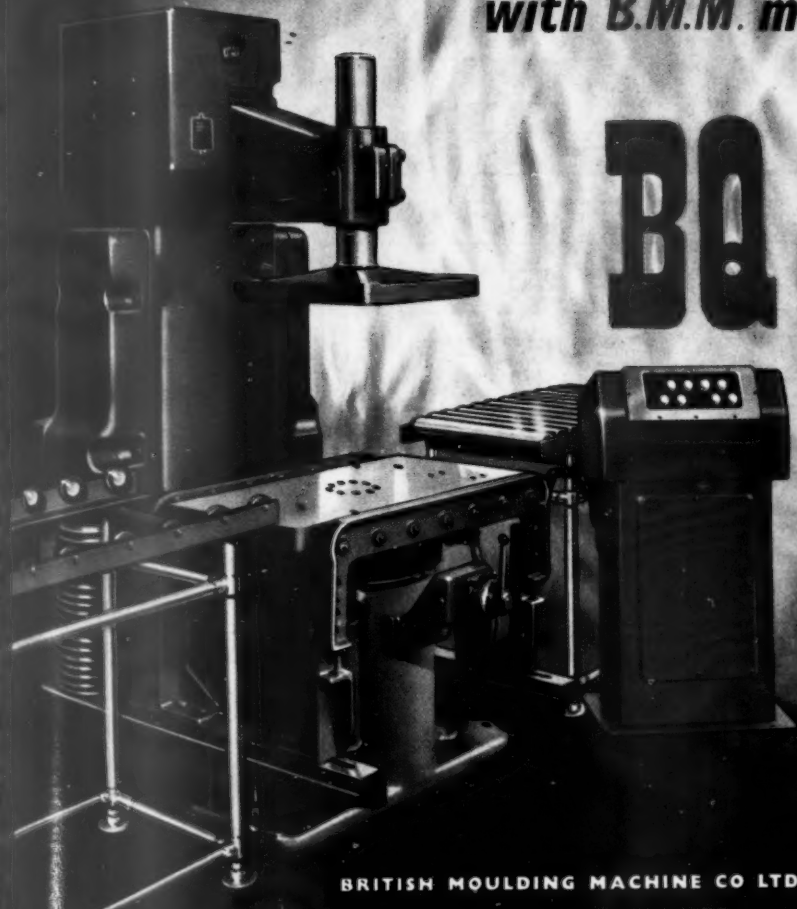

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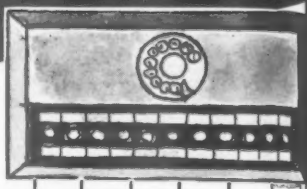

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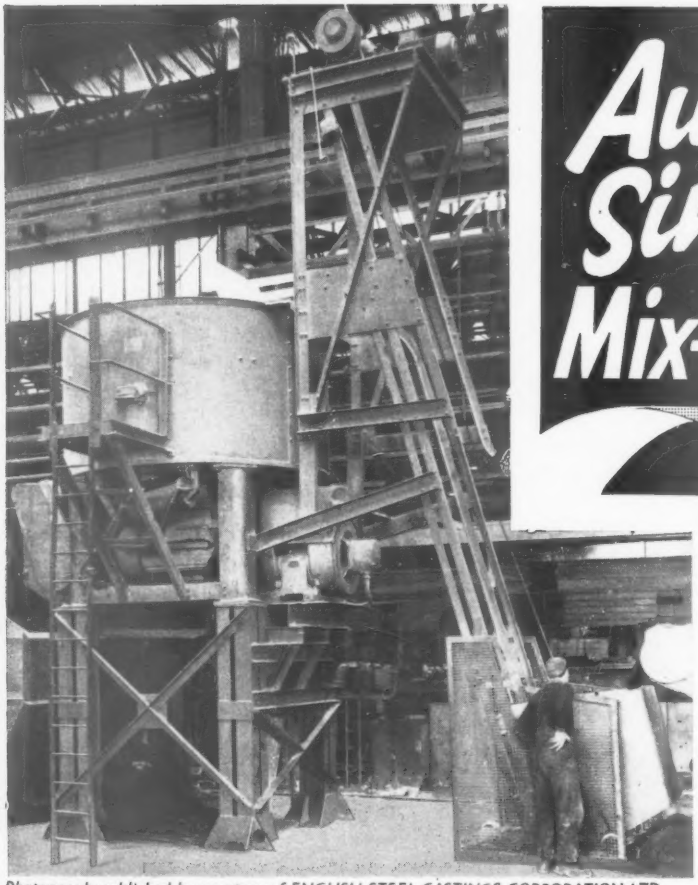

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FOUNDRY
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Vol. 106 MARCH 5, 1959 No. 2212

Price-cutting

Periodically during its long history the FOUNDRY TRADE JOURNAL has had to call attention to the irreparable damage done to the industry during periods of recession by insensate price-cutting, and letters to the Editor, published elsewhere in this JOURNAL, refer to flagrant examples of this evil. The excuses given by those accused of price-cutting are various, but the one most often used is the argument that only in this way can employees be found work. We remember this being put forward by a few founders who were prosecuted for buying scrap at prices above the controlled maximum. The latter action was against the law of the land, whilst excessive price-cutting is contrary to commercial morality and is equally reprehensible.

Everybody welcomes price reductions provided they are economic, but when a simple calculation shows that they barely cover raw materials and labour, let alone overheads, price-cutting is immoral, because whilst it lowers the financial standing of the price-cutters, it adversely influences the whole price structure of the industry by giving the purchasing agent a background of false values. If the price-cutter imagines that his guesswork is better than figures derived from a proper costing system, he is a candidate for a mental home, for he is just presenting pound notes to the customer with every batch of castings he delivers.

Cases have been brought to our notice, where gunmetal castings have been bought at a price lower than the combined value of the copper and tin content. Purchasing agents should be wise to the fact, that they will not receive proper satisfaction from such offers and, sooner or later, the source of such goods will dry up. Then when trade expands, they will find their castings requirements of but little interest to the reliable suppliers, and the onus of entertaining will again devolve upon the buyer and not the salesman. We address this subject as much to buyers of castings as to foundrymen, with the recommendation that if the former is on a good wicket, he should go on batting. Sticky wickets are fraught with danger!

Sandwell Castings' New Plant

The new £60,000 mechanized non-ferrous alloy foundry of the Sandwell Casting Company, West Bromwich, was opened on February 26 by the Mayor of West Bromwich, Councillor Thomas Rochelle. The Mayor, who is a moulder by trade, made the first mould from the new plant. It is estimated that the foundry will enable production to be doubled with a reduction in the labour force of 25 per cent. There will, however, be no redundancy, as the employees now "freed" have been transferred to other jobs without loss of prestige or pay.

The new foundry incorporates semi-automatic flow-line production, and a notable feature is a large electronically-controlled main hopper in which sand is sifted, cleaned and mixed. Another feature is a pallet conveyor on which mould boxes are transported to the casting area, whilst in the knock-out plant a pneumatic ram pushes the boxes from the conveyor on to a grid, after which the empty boxes are mechanically lifted on to another conveyor and taken back to the starting point near the moulding machines. The premises of the company have all been considerably extended since the last war, and further mechanization is now being planned. At present the monthly output totals approximately 200 tons of non-ferrous castings.

Sandwell Casting Company was founded 33 years ago, as a two-man enterprise with premises on a small part of what is now a very much larger site in Bank Street, West Bromwich. The premises now occupy more than five acres and the labour force is around 400. In 1935, the company in association with the Aston, Birmingham, firm of Sanbra, Limited, Hot Pressed Products of Perry Barr, Birmingham, and Conex-Terna, Limited, of Great Bridge, became a public company; 12 months ago it was acquired by the Delta Metal Company, Limited. Post-war extensions to existing buildings have cost £75,000 and it is estimated that a similar sum has been spent on modernization of plant and provision of new equipment.

Dinner

FOUNDRY TRADES' EQUIPMENT AND SUPPLIES ASSOCIATION

The annual dinner of the Foundry Trades' Equipment and Supplies Association was held under the chairmanship of Mr. Gavin C. Paterson, B.SC., president of the Association, at the Savoy Hotel on Wednesday, February 25. Following the loyal toast, "The Association" was proposed by Mr. A. E. Peace who referred to foundrymen's appreciation of the value of the after-sales service rendered by members of the Association. Mr. Paterson, in replying to the toast, referred to the forthcoming exhibition in May and made a plea for a more representative exhibition next time, with full participation by founders. Mr. W. M. Oddie, managing director, Spencer Halstead, Limited, proposed and Mr. P. B. Higgins, president of the Association of Bronze and Brass Founders, replied to the toast of "The Guests." Also at the high table were Mr. G. E. Lunt; Mr. G. W. Ilsley; Dr. C. J. Dadswell; Mr. V. C. Faulkner; Mr. C. O. Foster; Mr. N. P. Newman; Mr. R. Scott; Mr. R. A. Miller and Mr. D. E. B. Barnard.

Latest Foundry Statistics

Iron Castings: The Council of Ironfoundry Associations states that, 125,845 ironfoundry workers were employed in the United Kingdom during the week ending January 3, or 1,013 fewer than a month earlier. During the past year the decrease has been of the order of 11,000.

Forthcoming Events

MARCH 9

Institution of Production Engineers

Leeds section:—Annual general meeting followed by "Preventive Maintenance," by R. Shelton, 7 p.m., at the Hotel Metropole.

MARCH 10

Institute of British Foundrymen

East Anglian section:—Competition-paper Evening for the L. J. Tibbenham award, 7.30 p.m., in the Lecture Hall, Public Library, Ipswich.

Coventry and district section:—"Epoxide Resins in the Foundry," by M. C. Dixon, 7.30 p.m., at the Coventry Technical College.

National Society of Master Patternmakers

Works visit to Dunlop Rubber Company, Limited, commencing 2 p.m. Assembly at the central gate of the main entrance at the end of Holly Lane, Erdington, Birmingham.

MARCH 11

Institution of Plant Engineers

Edinburgh section:—"Factory Drainage," by T. W. Prentice, B.SC., 6.45 p.m., at 25, Charlotte Square.

Institution of Production Engineers

General meeting: Presentation of the 1958 Viscount Paper on the subject of "Production, Fabrication, Properties and Uses of Some of the Newer Metals," by Dr. N. P. Inglis, 6.30 p.m., in the Lecture Theatre, Department of Mechanical Engineering, University of Birmingham.

Liverpool section:—"Electronic Control of Machine-tools," by J. A. Stokes, B.SC., 7.30 p.m., at the Exchange Hotel, Tithebarn Street.

Preston section:—Annual general meeting followed by "Production Engineering Brains Trust," 7 p.m., at the Municipal Technical College, Blakey Moor, Blackburn.

Institute of British Foundrymen

West Riding of Yorkshire branch:—"Basic Cupola Operation at the J. Blakeborough & Sons, Limited, Foundry at Brighouse," by T. C. Wilson, 7.30 p.m., at the Institute of Technology, Bradford.

North-east Lancashire section:—"Some Aspects of Aluminium Casting," by Mr. Wood, 7.30 p.m., at the Accrington College of Further Education, Sandy Lane, Accrington. Presentation of the paper will be followed by a "Brains Trust."

MARCH 12

Institute of British Foundrymen

Lincolnshire branch:—"Services for the Moulder," by H. P. Millar, 7.15 p.m., at the Technical College, Cathedral Street.

MARCH 14

Institute of British Foundrymen

Newcastle branch:—Works visit to William Doxford & Sons (Engineers), Limited, Pallion, Sunderland. (Details from secretary.)

Scottish branch:—"Production of Spheroidal-graphite and Alloy Irons in Steelwork Practice," by G. Greig, 3 p.m., at the Royal College of Science and Technology, George Street, Glasgow.

East Midlands branch:—"Works Management and Human Relations," by C. S. Beers, 6 p.m., at the Gas Showrooms, Nottingham.

Scottish Industries Exhibition

The third Scottish Industries Exhibition is to be held in the Kelvin Hall, Glasgow, from September 3 to 19. Now that the British Industries Fair has ceased to function, this intermittent fair—previously held in 1949 and 1956—is easily the largest general exhibition staged in the UK. It has been extremely well supported in the past, and this year a large number of firms asking for space have had to be refused. The Exhibition is almost entirely a Scottish shop-window; it covers hundreds of industries and has a successful record of business resulting from participation in it. The Exhibition is obviously well worth a visit by trade buyers.

Tour of Northern Ireland Foundries

By V. C. Faulkner

The six counties coming under the jurisdiction of the Northern Ireland Government cover an area about the size of Yorkshire. Although the major portion of the foundry industry is concentrated in Belfast, there is a wide dispersion of firms over the whole area. A general survey of the industry is given at the beginning of the article, and then two foundries are dealt with *in extenso*, namely, Davidson & Company, Limited, and Harland and Wolff, Limited. Brief particulars are given of three others: Joseph Hamilton & Company, Limited; James Mackie and Sons, Limited, and N. A. Lyttle & Company, and the account concludes with a complete list of foundries in the area.

The wide dispersion of foundries in Northern Ireland is effectively illustrated in the map in Fig. 1, which shows particularly those towns which have foundries. The industry in the area produces over 25,000 tons of iron castings each year, and for these all the pig-iron has to come across the Irish Sea. The local (red) sands are not highly esteemed for moulding and some firms prepare synthetic or semi-synthetic sands, using Berkbond, Fulbond or the like. The local clay of this type has proved too expensive for general application. The foundries are inherently handicapped by lack of suitable raw materials in the area, and heavy transport charges

FIG. 1.—*Map of Northern Ireland, showing the principal towns, particularly those having foundries.*

to and from the United Kingdom. Moreover, where the export of engineering components to countries other than the UK is concerned, there is often the cost of transhipment to bear. Thus, founders have the option of either supplying purely local needs, or of operating exceedingly efficiently so as to be competitive in export markets. The best foundry, in the writer's opinion, certainly ranks amongst the most efficient anywhere, either in Europe or America.

There are no purely foundry employers' organizations, although at one time there was one catering for the non-ferrous founders. (Here, it is amusing to note that from the latter a small surplus fund is still in existence—about sufficient to pay for a small inaugural cocktail party if ever the association were resurrected!) Most foundries, however, belong to the North of Ireland branch of the Engineering and Allied Employers' Association.

Foundry owners in the area state that the local educational facilities for engineering training, etc., are quite good, but more could be done in the provision of foundry courses. The writer inspected one technical school where the plant available consisted of a crucible furnace, a moulding box and a heap of sand. In the foundries themselves, however, apprentices are well provided for, and the boys are taught their trade well. There is a large reserve of boys anxious to enter the engineering industries and foundries. Harland & Wolff, Limited, have recently erected a magnificently equipped apprentice-training school which, in the near future, will also cater for the foundry lads. The practice of permitting part-time day release of boys for training purposes is widespread and, as a community, the industrialists are "education conscious." One technical school being built at Lurgan will cater for 300 students, and will cost £500,000.

As new industries are constantly being attracted to the country, the outlook for jobbing foundry-work is distinctly favourable. General descriptions of some of the plants visited are given as follows:

Davidson & Company, Limited

Most founders in the United Kingdom know Davidson & Company, Limited, of Belfast as suppliers of cupola fans and ventilating equipment, yet the firm started in an entirely different sphere of operations. The activity by which they are known to founders is only one of several. It was in 1869 that Sir Samuel C. Davidson, K.B.E., after

FIG. 2.—*General view of the jobbing foundry of the Sirocco works, Belfast; preparation of moulds for the heavier types of castings can be seen in the foreground.*

much experience in India, patented a tea-drying plant. In the following year he also patented equipment for tea rolling, and set the pattern for later activities of his company as specialists in tea-plantation machinery. He established his works in Belfast in 1881 in a shed, on the site of the present service department, with a labour force of only seven men. To-day, the works covers an area of 12 acres and employs upwards of 1,500 persons, whilst a further 150 are employed in a South African subsidiary company. There is also an Australian subsidiary, and a large depot in Colombo which employs some 90 people. In addition, the firm is at present establishing an Indian manufacturing company, with headquarters in Calcutta. The range of manufactures now includes air-conditioning and dust-collecting plant; fans for power stations, mining, marine and all industrial requirements; air heaters and washers, and pneumatic conveyance units.

Foundrywork

The Sirocco foundry is actually a jobbing shop attached to a particularly efficient engineering works. From Fig. 2, which gives a general view of the ironfoundry, it will be seen that much of the production is made up of "one-off" jobs, some of them quite large. For smaller jobs which come in batches, moulds are made by a Jackman/Osborn jar/ram machine.

In the firm's non-ferrous foundry, a battery of Tabor machines take care of running lines. Here, there is a separate shop for sand reconditioning, served by a mill and a Pneulec Royer. The foundry is supplemented by separate well-equipped shops for coremaking, melting, and patternmaking. An interesting department is one devoted to the tinning of bearings, where it has been found that the choice of size of chilled grit, for blast-cleaning the components before tinning, has a profound effect on adhesion and the final result.

Use of the CO_2 Process

To relieve the pressure on accommodation in the drying chamber, the management has introduced the CO_2 Process in coremaking, which enables the ironfoundry to produce cores ranging from $\frac{1}{2}$ to 5 cwt. This process has also been applied successfully in the non-ferrous foundry in the production of large gunmetal castings weighing up to $\frac{1}{4}$ ton. A combination of CO_2 and green sand is used in the moulds for the manufacture of large rotor hubs, which are cast in aluminium alloys. In the heavy-work ironfoundry the prevailing practice is green sand and a combination of CO_2 and oil-bonded cores, for castings weighing up to six tons.

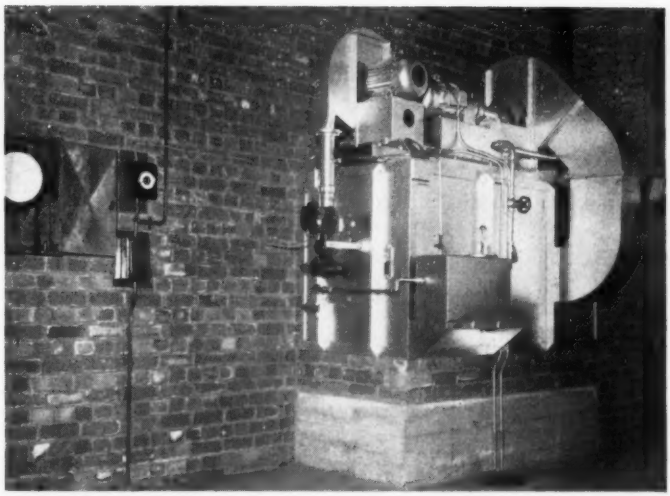


FIG. 3.—*Exterior of the new oil-fired corestove at Davidson's foundry, supplied by Modern Furnaces & Stoves, Limited. The oil burner, fuel-oil balancing tank, automatic shut-off valve, control thermostat and recording chart (left), are shown in the illustration.*

In the light-work ironfoundry, which is engaged in the production of bearings of all sizes, CO_2 has been applied to some of the moulds and cores quite successfully.

New Drying Stove

An oil-fired drying stove for cores and moulds, supplied by Modern Furnaces & Stoves, Limited, of Birmingham, has recently been installed in the ironfoundry. With a capacity of 3,300 cub. ft., it can accommodate over 20 tons of cores at one charge. Fuel consumption is about 2 gall. of fuel oil per ton dried, with a maximum consumption of 8 gall. per hr. The heating unit operates on the cross-jet recirculatory system. In this, the drying gases, having passed once through the stove, are drawn through two openings in the floor at the front of the stove and pass along under-floor ducts. The suction is supplied by a recirculating fan housed in a refractory-insulated pocket, integral with the furnace. The hot gases are then blown across one end of the combustion chamber to be evenly distributed throughout the stove. Drying temperature is thermostatically controlled by automatic adjustment of the air and oil supplies. Safety measures included in the installation are explosion-relief panels in the stove roof and on the oil burner itself, and a fan-failure protection device, which automatically shuts off the fuel if the supply stops for any reason (see Fig. 3).

The firm is in the happy position of being able to get all the apprentices it needs. Twice a year entrance examinations are held, and for the works' intake of half-a-dozen lads, up to 100 boys may compete for the vacancies.

Acknowledgments

For the help in compiling the above account, and for permission to publish, the writer acknowledges with gratitude the co-operation accorded him by Mr. Savell O. Hicks, O.B.E., works director, and Mr. S. Jeffers, foundry foreman.

Harland & Wolff, Limited

Whilst shipbuilding in Belfast dates from the 17th century, the foundations of Harland & Wolff, Limited, were laid when, in 1885, Mr. E. J. Harland bought the yard at Queen's Island from Robert Hickson. Mr. Harland was assisted financially by his friend, Mr. G. C. Schwabe, who was an uncle of Mr. G. W. Wolff his private assistant. The first order was for the Venetian, a ship for the Bibby Line. Since that time, no fewer than 1,400 vessels have been launched from Queen's Island. These data were taken from the presidential address delivered by Mr. Denis Rebbeck before

FIG. 4.—*Harland & Wolff's No. 5 bay in the iron foundry; here, large cylinder-liners, mainly for ships' engines, are produced more or less on a flow-production basis.*

FIG. 5.—*General view of No. 1 heavy-iron-moulding bay of Harland & Wolff's Belfast foundry. The drying stoves are at the rear and the cupolas on the right-hand side.*

the Belfast Association of Engineers in 1947. His address was an extremely interesting account of the growth of the North of Ireland as a shipbuilding centre. Harland & Wolff is the largest shipbuilding unit in the world and employs between 20,000 and 30,000 people. Though it operates very large iron and non-ferrous foundries, the relation of these sections to the whole establishment is small.

Iron Foundry

The iron foundry (Figs. 4-6) is in reality an enormous jobbing shop, which has to deal with the demand for various types of castings required by the Belfast organization. This demand is by no means confined to marine-propelling and auxiliary-machinery castings, but includes castings for electrical generators and motors of all types, land engines, and oil-refinery equipment covering a wide range of engine-driven reciprocating and centrifugal compressors.

The shop is excellently equipped with numerous overhead cranes, having lifting capacities of up to 100 tons. Molten metal is provided from centrally-placed cupolas having hourly outputs ranging from 3 to 15 tons. As one would expect with such a diversification of quite large castings, loam moulding is extensively practised, and there is still a large number of these highly-skilled moulders. The commendable system of operating a nightshift for knocking out the moulds, and making the shop ready for the next day, is in operation. No dressing of heavy castings is carried out in the foundry. This work is all done in a separate shop equipped with a shotblast room. A self-contained foundry is set apart to handle all light castings, which here again are not of a repetitive nature.

Non-ferrous Foundry

The Harland & Wolff non-ferrous foundry at Belfast is also of large proportions, and is divided into two sections, heavy and light. In the heavy section a battery of 4 reverberatory furnaces, with capacities ranging from 5 to 14 tons, is available to deal with the largest size of manganese-bronze propellers, gunmetal shaft-liners, and other heavy non-ferrous castings. In the light section a battery of crucible furnaces supply the wide range of metal specifications which are called for. One section of this shop is entirely given over to the production of moulds and cores by the CO_2 Process. The supplies of gas for this department are piped from a central liquid-CO_2 plant to the working places. However, to ensure continuity of production when recharging the central plant, a battery of CO_2 cylinders spaced around the walls has been retained. For the provision of suitable sand for the process, a modern drying plant is at present being installed.

Patternshop—This shop is very large and splendidly equipped with modern machine tools. All machine waste is disposed of by means of underfloor ducts, with sweep-ups at many points around the benches leading to a special destructor house.

Apprentice-training school—A recent development of which the firm is justly proud is the provision of an apprentice-training school. Well-equipped and provided with a diverse selection of machine tools, it is catering at the moment for the mechanical, shipyard and electrical trades, but as soon as possible the intention is to extend its activities to include the foundry youths. The lecture theatres available in the school would be the envy of most universities, as their furnishings are admirable. It is obvious that the firm is taking a real interest in their foundry apprentices, as the writer was introduced to two lads who had been released to take the courses at the National Foundry Craft Training Centre in West Bromwich.

Owing to the shortness of the time spent in the works, it has only been possible to give a broad impression of the work carried on, for, in addition to the foundries, the writer was privileged to see the machine-shops, and also the main shipyard joiner shop, which is a veritable furniture factory. In these sections also, it was very satisfying to see high-grade craftsmanship being used on the best of raw materials.

In conclusion, the writer expresses his indebtedness to the foundry management for their kindness in acting as guide during the visits to these extensive shops.

Other Foundries

During his stay in Belfast, the writer also visited the foundries of Joseph Hamilton & Company, Limited, 104, Percy Street, Belfast; James Mackie and Sons, Limited, of Belfast, and N. A. Lyttle & Company, of Portadown.

The former is a non-ferrous foundry operated in conjunction with what is obviously a prosperous works-maintenance business. It has a large machine-shop, containing a wide range of modern machine-tools, and a separate welding department. Major additions and developments to buildings and plant are carried out to the works which the company services. The foundry is a compact shop and the whole concern is characterized by a neatness seldom encountered in this type of enterprise.

The works of James Mackie & Sons, Limited, is devoted to the manufacture of textile

TABLE 1.—*Foundries of Northern Ireland.*

Name and address.	Type of casting made.
Air Conditioning & Engineering (N.I.), Ltd., Tandragee, Co. Armagh	Iron and non-ferrous
James Blair, Ltd., 44 Townend Street, Belfast	Non-ferrous
B.M.C. Metal Products, Ltd., Clady Works, Dunadry, Co. Antrim	Aluminium, sand, gravity- and pressure-die castings
A. Brown & Sons, 79 Foyle Street, Londonderry	Iron and non-ferrous
Brown Square Iron & Brass Foundry, Ltd., Turin Street, Belfast	Iron
Carson & Robinson, 110 Ligoniel Road, Belfast	Iron and non-ferrous
Cotton, Stephen & Sons (Engineers), Ltd. 46/50 Sydney Street West, Belfast	Iron and non-ferrous
Robert Craig & Sons (Engineers), Ltd., 13/27 St. George's Street, Belfast	Phosphor-bronze, brass, aluminium
Craig's Engineering Works, 76 Strand Road, Londonderry	Iron, brass, aluminium
J. Hamilton & Co., Ltd., 102/104 Percy Street, Belfast	Non-ferrous
Davidson & Co., Ltd., Sirocco Works, Belfast	Iron and non-ferrous
Harland & Wolff, Ltd., Queen's Island, Belfast	Iron and non-ferrous
W. H. Kane & Co., Ltd., Larne Foundry, Circular Road, Larne, Co. Antrim	Iron and non-ferrous
H. Kennedy & Sons, Ltd., The Foundry, Coleraine, Co. Londonderry	Iron
N. A. Lyttle & Company, Bridge Street South, Portadown, Co. Armagh	Iron
James Mackie & Sons, Ltd., Albert Foundry, Belfast	Iron and non-ferrous
D. M. Moore & Sons, Ltd., Brook Street, Coleraine, Co. Londonderry	Iron and non-ferrous
Musgrave & Co., Ltd., St. Ann's Works, Belfast	Iron and non-ferrous
J. & J. McKeown, Ltd., Grosvenor Road, Belfast	Iron
Portadown Foundry, Ltd., Foundry Street, Portadown, Co. Armagh	Iron
Ritchie, Hart & Co., Ltd., 16/18 Mountpottinger Road, Belfast	Iron and non-ferrous
Ulster Foundries, Ltd., Sydney Street West, Belfast	Iron (up to 5 cwt.)
Wellman Smith Owen Engineering Corporation, Ltd., Falls Foundry, Belfast	Iron and non-ferrous

FIG. 6.—*View of Harland & Wolff's No. 7 foundry bay, where, in the foreground, moulds are being prepared for thrust blocks and cast-iron spare propellers.*

Tour of Northern Ireland Foundries

machines for the jute and associated industries. Its mechanized foundry is amongst the world's best. The present policy of the board of directors is that no description of the foundry is to be published, so the above bare statement must suffice.

Mr. Lyttle's foundry, which is situated in Portadown, is purely a jobbing shop. Good quality grey-iron castings are produced by highly-skilled moulders.

Conclusion

In concluding this " birds-eye view " of foundries in this somewhat remote part of the United Kingdom, the writer records his warmest thanks to Mr. M. N. Boyde, the representative in this area of Foundry Services, Limited. Throughout the series of visits he acted as a particularly well-informed guide. His knowledge of the whole of the Irish foundry industry and its personnel is profound, and his help was much appreciated.

(A list of foundries in Northern Ireland is given in Table 1.)

Company News

W. G. ALLEN & SONS (TIPTON), LIMITED, colliery, railway, and mechanical engineers, of Tipton (Staffs)—Second interim dividend of 2½ per cent., making 5 per cent. to date (one interim dividend of 2½ per cent.).

BARROW HAEMATITE STEEL COMPANY, LIMITED—Close Bros. announces that the offer to purchase all the ordinary shares of the company has been accepted by the holders of over 90 per cent. and has accordingly been declared unconditional. In respect of the remaining ordinary shares the offer is open for a further 14 days from February 24.

FALK, STADELMANN & COMPANY, LIMITED, makers of lighting, heating, and cooking appliances, of London, E.C.1—Ordinary holders are to be offered one new £1 share at 20s. 6d. for every three held. The board intends to pay 10 per cent. for the year ending March 31, but the new " rights " shares will get only half the 5 per cent. interim. A free issue on a one-for-two basis is also announced.

CAPPER PASS & SON, LIMITED, smelters and refiners of non-ferrous metals, of Bristol—A first interim dividend of 4 per cent. on account of the year to March 31, 1959, compares with 3 per cent. and is as forecast. At the meeting in November, Mr. A. D. Pass, chairman, said the directors felt justified in maintaining the dividend for 1957-58 at 8 per cent. and had hoped to pay 9 per cent. He added it was hoped to pay an extra 1 per cent. on the first interim for the current year.

CLARKE, CHAPMAN & COMPANY, LIMITED, marine and electrical engineers, of Gateshead—The company is effectively maintaining its distribution with a payment of 13¼ per cent. for 1958 on capital doubled by a free scrip issue. Trading surplus is down from £1,475,999 to £1,041,208, after the inclusion of £300,000, against £550,000, estimated profits on long-term contracts in respect of prior years. The profit balance, after all charges, shows a reduction from £555,641 to £371,775.

GAS PURIFICATION & CHEMICAL COMPANY, LIMITED—The company reports a net profit before tax of £223,208 for the half year to December 31, 1958. The profit for the second half of the financial year may not be at the same rate, since seasonal trading factors may operate during this period, the directors state. A group deficit of £216,343 was incurred in the year to June 30, 1958, after tax of £32,503, subsidiaries' losses of £492,044, and £48,500 provision against unsecured loans.

N. HINGLEY & SONS, LIMITED, ironmasters, forgemasters, etc., of Netherton, Dudley (Worcs)—In declaring an unchanged interim dividend of 3½ per cent. the chairman, Mr. F. N. Lloyd, states that profits for the year ending March 31, 1959, are lower and the unchanged interim should not be taken as an indication that the year's dividend will be maintained at the same rate as for 1958. For 1957-58 there was a final dividend of 6½ per cent. and a bonus of 2½ per cent., making a total of 12½ per cent.

EXPANDED METAL COMPANY, LIMITED—The company is effectively raising the dividend by 2 per cent. to the equivalent of 16⅔ per cent. for 1958 by the declaration of a second interim of 12 per cent. in lieu of a final on a capital recently increased by a one-for-four scrip issue. It is also proposed to issue 487,768 5s. ordinary shares at 11s. 6d. by way of a one-for-five rights offer. The new shares will not rank for the second interim now declared. Subject to audit, the 1958 group net profit of £122,000 compares with £100,411 after tax of £162,000 (£154,851).

BIRFIELD, LIMITED, general engineering supplies, of London, W.1—Net trading surplus in the first quarter of the current year fell by nearly £250,000 to £162,000. Sales in the same period declined to £4,540,000 from £4,817,000 previously. Three factors which affected the results are advanced by the directors—lower turnover (severe in some directions), increases in costs that cannot as yet be recovered, and higher expenditure on developing future products. There is reason to hope that there may be some improvement towards the end of the year. For the year ended July 31, 1958, net profits rose to £501,852 from £372,425, after tax of £977,281 (£908,247).

MONSANTO CHEMICALS, LIMITED—An unchanged second interim dividend of 8½ per cent. makes a total of 13½ per cent. for 1958 as previously. Net sales of the company in 1958 were £15,426,633, compared with the previous year's record of £15,683,272. Direct export business accounted for 35 per cent. of total sales, a contribution of £5,429,222 to turnover, albeit at lower profit margins than heretofore, says the chairman, Sir Miles Thomas. The year was one of consolidation of manufacturing resources. The opening of new plants for new products occupied much of the company's effort, and the resultant ability to reach new or expanded markets should strengthen its position in the increasingly competitive situation now faced. Group trading profit and other income rose from £3,256,574 to £3,499,744, but due to heavier provisions for depreciation and obsolesence and for interest charges, the net profit, after tax, shows a reduction from £1,078,557 to £992,415.

Recent Wills

AMES, W. A. B., a director of the British Electrical & Manufacturing Company, Limited, Newcastle-upon-Tyne £39,921

JARVIS, HAROLD, formerly head of William Jarvis & Sons, ironfounders, of Middlestown, near Wakefield (Yorks) £28,162

STEWART, T. F., chairman of Duncan Stewart & Sons, Limited, hydraulic and steelworks engineers, sugar machinery manufacturers, etc., of Glasgow £135,432

HARMER, A. E., formerly secretary of W. J. Harmer, Limited, ironfounders and manufacturers of piano frames, of Luton (Beds) and Walton-on-the-Naze (Essex) £3,024

Development of a Marine-propeller Alloy*

By A. J. Smith†

The development of a casting practice for a new alloy is sometimes difficult because of the peculiar characteristics of the new material. This is especially true when the castings are large in size and weight, such as large ship's propellers. Experimental work must necessarily progress slowly. Some of the problems encountered, and their eventual solution, are described.

A programme was initiated by the central technical department of the author's company to examine the wear characteristics of a large number of modern tanker propellers, with varying lengths of service, and under many conditions of operation. The results of this study show about 0.140 in. depth of surface wear in five years.

Early Investigations

A co-operative research programme was established on a group of reputable alloys, studying their wear resistance under laboratory conditions simulating propeller service. The method for evaluating the wear characteristics was to spin flat, cast, machined blocks in sea water at a nominal tip velocity of 27 ft. per sec. for 60 days. The final choice of alloy was made when it was found that nickel/aluminium-bronze had the best combination of wear resistance, mechanical properties and foundry handling characteristics. The chemical composition, mechanical properties, and preliminary spin-test results of nickel/aluminium-bronze and manganese-bronze, are shown in Table 1.

Working with a new and unfamiliar alloy, the foundry was confronted with several problems which had to be solved, at least in part, before any production castings could be made. Such general subjects as raw-material specifications, metallurgical control, melting, moulding materials, risering and refractories were given primary consideration. Consistent mechanical properties were obtained from test coupons made to ASTM B208-54 (Fig. 1 (a)‡) the double keel-block (Fig. 3‡). The influence of pouring temperature upon mechanical properties was found to be insignificant. Shrinkage was somewhat greater than for manganese-bronze.

Later experience on production-size castings discounted some of the results of this early experimental work.

Experimental Furnace Work

Burner Position

It was found that nickel/aluminium-bronze could be melted more rapidly when the burner flame impinged on the metal. It can be generally stated that furnaces equipped with burners close to the metal line will melt nickel/aluminium-bronze more efficiently than burners remote from this area. This is not as obvious as it might appear to be as, theoretically, melting in a reverberatory furnace is accomplished by direct contact with the gas and heat radiated from the refractory.

TABLE 1.—*Test Results of Nickel/aluminium-bronze, and Manganese-bronze.*

—	Nickel/aluminium-bronze.	Manganese-bronze.
Chemical composition, per cent.:		
Copper	78–81	55–60
Zinc	In "all others"	Remainder
Nickel	4.5–5.5	—
Iron	3.5–5.5	0.9–2.0
Manganese	0.5–1.0	0.3–0.9
Aluminium	9.0–10.3	0.7–1.0
Lead	0.01 max.	0.4 max.
Tin	In "all others"	1.5 max.
All others	0.5 max.	—
Mechanical properties (normal range):		
	Tons per sq. in.	Tons per sq. in.
Yield	15.6–19.2	12.0–14.7
Tensile	35.7–42.4	26.8–31.2
Elongation, per cent in 2 in.	15–30	20–35
Proof stress	12.5	6.2–7.1
Brinell hardness No.	152–190	112–130
Fatigue—air	9.4–11.1	4.0–6.2
Fatigue—salt water	8.0–9.8	4.0–5.6
Density—lb. per cub. in.	0.273	0.297
Spin test:		
Weight loss, mg. per sq. decimetre per day	99.0	376.0
In. penetration per year	0.019	0.263

Combustion

A neutral furnace atmosphere was most desirable, but impossible to maintain. Theoretically, a neutral or oxidizing atmosphere would prevent hydrogen absorption by the metal. Likewise, a reducing atmosphere would prevent oxidation of the aluminium, resulting in the formation of dross. However, it was found that combustion conditions were constantly changing during the melting period, and good furnace practice required careful manipulation of the burners to prevent excessive gas absorption.

Fluxes

The primary functions of a flux are: (1) to react with the oxides; (2) to prevent the formation of additional oxides, and (3) to form a fluid slag to prevent gas absorption. The most effective fluxes

* This article is an abstract from a paper published by the American Foundrymen's Society, to be presented and discussed at its 63rd Castings Congress in Chicago from April 13 to 17.

† The author is metallurgical, and assistant foundry, superintendent in the shipbuilding division of Bethlehem Steel Company, of Staten Island, N.Y.

‡ Figures referred to are ASTM specification illustrations.

for rotary-furnace treatment of aluminium-bronzes appear to be the fluorides (potassium-titanium-fluoride and anhydrous potassium-fluoride) used singly or mixed. Sodium chloride and potassium chloride, borax salt mixes, sal-ammoniac and manganese sulphate are also used. Such compounds are generally the basis for some proprietary fluxes which have been used with marked success in crucible furnaces, but with an equal lack of success in the reverberatory furnace. Experience with both experimental and production furnaces indicated that all types of fluxes tried to date were unsatisfactory.

Gas Absorption

In actual practice gas is picked up by the metal during a reducing period, or from contaminants on the metal charge. It is widely accepted that the gas is hydrogen. The presence of gas in metal can be determined by equipment known as a vacuum tester. The problem was to determine when a melt required degassing, and how to remove the gas if removal were required. A common method of degassing adopted by the foundry involves the use of an inert gas to flush the dissolved gas by mechanical agitation. Melting nickel/aluminium-bronze cannot be accomplished without some degree of gas absorption. However, with carefully controlled rapid melting, the use of hot dry ladles, and an effective method of degassing, it is possible to deliver to the mould a metal containing a tolerable gas content.

Moulding Materials

For many years, the author's foundry has used a natural-bond baked-gravel sand for propeller moulds. During the nickel/aluminium-bronze casting-development period, experiments were made with a cement-bonded sand. These sands were compared with the standard gravel sand.

Advantages of the cement process were found to be as follows: (1) Moulds are air dried, and require no costly drying equipment; (2) no highly-skilled personnel are required, and (3) moulding material has greater strength.

Claimed advantages which were not substantiated were: (1) Propellers can be cast closer to size; (2) better quality, and (3) labour costs are reduced.

Disadvantages of the cement-sand process were: (1) A well-heated shop is required to prevent freezing of moulds in winter; (2) moulding materials are more costly; (3) moulding material must be used within a few hours after mixing; (4) shakeout time increased; (5) cement cannot be re-used, and (6) cement process lacks flexibility.

Raw Materials

From the outset rigid raw-material requirements were set up for the ingot metal. For example, the use of scrap material for manufacturing nickel/aluminium-bronze ingots was prohibited. Only in this way could the presence of contaminating elements, which could affect mechanical properties, casting quality, and weldability, be prevented. When a charge needs adjustment a master alloy containing the required additions is added to the charge.

Feeding of Production Castings

Feeding practices employed for small castings were not applicable to large propellers. Metal from the ladle is poured into a runner basin containing a flow-control valve. When the basin is full the valve is opened, and metal flows through the down-stick and ingate to the base of the hub, until the hub is filled, and until metal rises to a height of 6 to 12 in. into the riser. Metal of approximately 100 to 150 deg. F. (38 to 65 deg. C.) hotter than the original pour is then added to the riser through a separate riser gate. The riser is insulated with a sleeve and cover of permeable casting plaster. Plaster has the advantage of being comparatively low in cost, and simple to make.

Directional Solidification

Most propeller designs are conducive to good directional solidification, as the hub section is tapered and cast with the large end up. The large hot-metal addition which is made to the insulated riser aids in setting up a temperature differential necessary for proper feeding. There are certain factors which tend to complicate the casting operation, for instance the alloy absorbs gas during melting, but it is possible to produce sound castings providing the gas content is not above a tolerable level, and providing the rate of solidification is rapid enough to keep the gas in solution.

Exothermic Reaction

Insulating plaster sleeves, which had been successfully employed for manganese-bronze, could not be used for nickel/aluminium-bronze, as the higher pouring temperature of 2,080 to 2,130 deg. F. (1,138 to 1,166 deg. C.) caused an exothermic reaction resulting in a violent boiling action. Riser sleeves made from perlite, diatomaceous earth or other insulating materials, have been used with some degree of success. Exothermic sleeves or pads are only partially effective in increasing feeding efficiency. Equally effective results can be obtained from much less costly materials.

Pouring Temperature and Chills

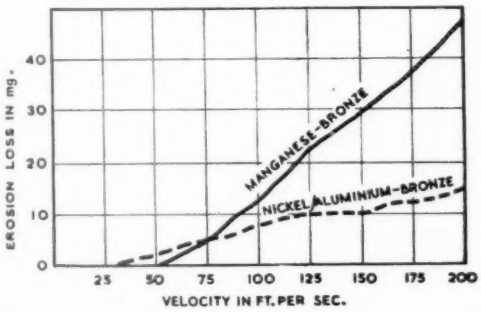
The extremes of pouring temperature requirements must be met, when it is considered that casting dimension vary from approximately 1 in. thick at the blade tip to 15 in. thick in the hub section. A compromise temperature of approximately 2,100 deg. F. (1,150 deg. C.) appears to satisfy both of these requirements. Although external chills judiciously placed in a mould have been successfully used by foundrymen for many years, the use of air- or water-cooled chills has been confined to relatively few applications. It was decided to make a direct comparison of the influence of such a chill upon the rate of solidification of a large casting, by pouring two identical propellers, one being chilled, under closely

controlled conditions, and plotting a time-temperature curve on each. These time-temperature curves aptly demonstrated the effectiveness of the water-cooled chill, which had a most immediate influence on the lower portion of the propeller hub. Within 15 min. the temperature began dropping at a comparatively rapid rate. This was not felt at the 21-in. location for 104 min., but at 170 min. the chilled casting at this location had cooled to 1,515 deg. F. (824 deg. C.). The non-chilled casting required 400 min. to cool to this temperature, and was still in a liquid mushy stage at the end of 400 min., and still depended upon the riser for feeding. The results of the tests showed that water-cooled chills can be used effectively to decrease the solidification time for a large casting. Gas, steam or air could also be used to cool the chill, but were less satisfactory than water. There are, however, certain disadvantages in the use of the water-cooled chill which make it unattractive. It does not allow for the human error.

Comparison of Nickel/aluminium-bronze and Manganese-bronze

Comparative data on chemical composition, mechanical properties and erosion-corrosion resistance are shown in Table I. Further erosion-corrosion test data are shown in Fig. 1.

FIG. 1.—*Graph showing the erosion losses on 8-in. discs which had been spun for 500 hr. at a peripheral velocity of 200 ft. per sec.*



Uniformity

Mechanical properties of nickel/aluminium-bronze show that only minor variations in properties exist from light to heavy sections, whereas manganese-bronze lighter sections almost always exhibit properties superior to those of the heavy sections.

Comparative Service Data

Of two large high-speed, ocean-going luxury liners, one has nickel/aluminium-bronze propellers and the other propellers of manganese-bronze. Runs are similar in all respects, but notable fuel savings have been made on the ship with the nickel/aluminium-bronze propellers.

Propeller Efficiency: The design engineers at the author's company are most impressed by the ability of nickel/aluminium-bronze to retain its original smooth machined surface over a long period of time, thereby retaining its high efficiency factor. Numerically, the improvement in efficiency is in the order of about 1.5 to 3.0 per cent., with resultant fuel savings.

Design Benefit: As nickel/aluminium-bronze is approximately ten per cent. lighter in weight than manganese-bronze, and can be designed to thinner sections because of its higher strength, other advantages become apparent. For example, loading stresses on the tailshaft and bearings are reduced, thus permitting smaller shafts.

Propeller Cost: Reduced weight of nickel/aluminium-bronze, in conjunction with increased strength of the material, allows of designing the propeller approximately 18 per cent. less in weight than a comparable manganese-bronze propeller. Although the former is more costly in price per pound, the long-term cost reduction is appreciable.

Summary

Melting Practice: (*a*) It was found necessary to move the burner flame closer to the metal bath to prevent excessive oxidation of aluminium, and to obtain faster melt-downs; (*b*) close control of the combustion atmosphere was required to prevent excessive gas (hydrogen) absorption and oxidation, and (*c*) it was found essential that raw materials be controlled by rigid specifications.

Gas Absorption: Gas pickup could not be avoided entirely, but could be reduced to a comparatively harmless level by flushing with inert gas.

Refractories: There is an apparent need for high-grade refractories at reasonable cost.

Fluxes: Fluxes were successfully employed in crucible furnaces, but hindered the melting operation when used in the reverberatory furnaces.

Feeding: Water-cooled chills were successfully used to promote directional solidification in large propeller castings, and materially reduced the time required for complete solidification to take place.

Pouring Temperature: For nickel/aluminium-bronze of low gas content, pouring temperature has no appreciable influence upon mechanical properties.

Advantages of Nickel/Aluminium-bronze: Aluminium-bronze is rapidly gaining in popularity throughout the shipbuilding industry. Comparative service tests under identical conditions of operation have shown nickel/aluminium-bronze in a favourable light. Some of the advantages of this new alloy are made obvious by comparing its mechanical properties with those of manganese-bronze. Other less obvious advantages are:—

(*a*) Propeller efficiency is retained over a long period of time due to the alloy's resistance to surface roughening; (*b*) because of its lower density and higher strength, a nickel/aluminium-bronze propeller can be made approximately 18-per cent. lighter in weight than a comparable manganese-bronze propeller; (*c*) although the nickel/aluminium-bronze alloy is more costly, its long-term cost is lower than that of manganese-bronze, and (*d*) nickel/aluminium-bronze propellers require less maintenance than manganese-bronze propellers.

Equipment & Supplies

Radial-saw

A new all-purpose radial saw in the Bursgreen range has just been announced by Wadkin, Limited, Green Lane Works, Leicester. This machine (type BRA) has a saw unit that can be swivelled to any angle to enable the machine to do every kind of cross cutting, mitring, compound mitring, and also straight and bevel ripping. The saw spindle accepts trenching heads for a wide range of ploughing, grooving, birdsmouthing, etc., and moulding and rebate irons can also be used.

With a 14-in. saw the machine (Fig. 1) will cut a maximum width of 14 in. with a maximum depth of 4½ in., or a width of 17 in. by 1 in. deep. The saw unit traverses an overhead arm which has a rise and fall movement of 14 in. The arm may be swivelled 45 deg. either way. The pull-over movement of the saw unit is on sealed-for-life ball-bearings, which maintain ease of operation indefinitely, and the saw carriage can be locked at any position along the arm, and be rotated through 180 deg. In addition the saw unit tilts inside a yoke to any angle between horizontal and vertical. With the spindle in the vertical position the machine becomes an overhead moulding and recessing machine. Plunger stops locate all the principal angles on both the arm and saw unit, and powerful locks are fitted on all movements.

The motor, which is on the saw spindle, is rated at 3 h.p., and controlled by push buttons. The machine is designed to give maximum safety to the operator, and the universal guard provides adequate protection at all positions of the head. A riving knife and a kick-back device are built into the guard. A safety feature in the control gear prevents accidental starting of the motor after any interruption in the power supply, and an overhead device is included to protect the motor.

FIG. 1.—*All-purpose radial saw, now being marketed by Wadkin, Limited, of Leicester.*

The machine is mounted on a fabricated-steel base, which can be fitted with panels and hinged doors to form a tool cabinet. The wooden table is 4 ft. by 1 ft., and is mounted on levelling screws. An adjustable fence and a cutting-off stop-bar can be provided if required.

Hand-cleanser Dispenser

DEB Chemical Proprietaries, Limited, of Forfar Chemical Works, Belper, Derbyshire, are now marketing the Spenso dispenser of hand-cleansing material (Fig. 2). It consists of a bracket, which may be fixed to a wall, on which rests a 1-gall. can. A pump unit clips on to the bracket, and down over the lip of the can, and can be tightened into position. It is suitable for any factory washroom, and eliminates waste and pilfering.

FIG. 2.—*Dispenser for hand-cleansing material, introduced by DEB Chemical Proprietaries, Limited, of Derbyshire.*

Graphite Nipples for Arc Furnaces

British Acheson Electrodes, Limited, Wincobank, Sheffield, makers of "Acheson" graphite electrodes for electric-arc furnaces, announce the extension of their range of large-dia. taper-jointed electrodes. 16- and 14-in. dia. graphite electrodes, with taper jointing, have been introduced to join the present 20-in. taper-jointed electrodes. The new 16-in. dia. electrode has a nipple with a major dia. of 8¾ in. and a length of 12 in., which gives a thicker socket wall, in addition to the extra protection and life given to the socket by the 1-in-6 taper.

The new 14-in. dia. electrode is machined to take a nipple 8 in. at the major dia. and 10 in. long, which again means a thicker socket wall. To ensure security and tightness of joints, the threading of the nipple and socket is four threads per in., machined to fine tolerances to ensure perfect matching of tapers. A 12-in. dia. electrode, with nipples and sockets for taper joints, is to be introduced shortly.

Specialized Brazing

Newton Victor, Limited, 132-135, Long Acre, London, W.C.2, have recently introduced a new service to industry—specialized brazing. The brazing plant provides for treatment of components in controlled atmospheres and under vacuum. It includes radiation and muffle furnaces, with which temperatures up to about 1,800 deg. C. can be achieved, and handles parts up to approximately 3½ in. square and 10 in. long. Joints catered for include: stainless steel to stainless steel; stainless steel to steel; copper to steel; steel to steel; copper to copper; steel to Nilo K, and Monel to other metals. A method of brazing beryllium has also been developed, and applications for tungsten brazing can be investigated.

HEDIN, LIMITED, Commerce Estate, South Woodford, London, E.18, have introduced a new model into their range of humidity cabinets. It is equipped with a refrigeration plant to enable low-temperature testing to be carried out to M.O.S. and other specifications, and has a capacity allowing temperatures of −10 deg. C. to be obtained in an ambient of 20 deg. C. The unit is powered by an electrically-driven, hermetically-sealed compressor, circulating Freon 12 refrigerant.

Follsain-Wycliffe re-house Fettling and Machine-shops

This article is an account of improvements recently made to the premises of Follsain-Wycliffe Foundries, Limited, consisting mainly of a new fettling shop, and a new machine-shop. In addition, a brief description is given of the newly-installed dust-extraction and air-heating equipment and the recently-built canteen and social centre.

The fettling department at the works of Follsain-Wycliffe Foundries, Limited, of Lutterworth, was originally housed in a separate part of the main foundry. When additional moulding area was needed it was decided to erect an entirely new building for use as a fettling shop, thus freeing floor space for moulding. Fettled castings had formerly to be transported across a yard to the despatch store, which was adjacent to the foundry. This store seemed ideally suited for pattern storage, so the new fettling shop was planned to incorporate a despatch bay, with two loading docks.

A building 225 ft. long by 30 ft. wide has been erected on spare land. It is constructed of steel framework, with asbestos sheeting for roof and side walls above a 6-ft. brick wall, the gable ends being also of brick. The roof is of the north-light type, and all the floor-stand grinders are sited below the glazed section.

The building is illuminated by 5-ft. tubular lighting fixed as continuous trunking running the length of the shop in two runs, double tube fittings being used at the fettling end, and single-tube in the stores area.

Fettling Shop

Eleven bays in the building house: two Spencer & Halstead Centriblasts for cleaning castings after annealing; five pairs of double-ended high-speed grinders; one single-wheel high-speed grinder; two small bench grinders in an exhaust cabinet; several Hicycle hand-grinders fitted with Holman Dustraction equipment, and the final-inspection bench. A general view of the shop is shown in Fig. 1.

To prevent sparks or grit from one machine becoming a hazard to the operator of the next machine, guards are placed between them. Experimental plastic screens are being used between the

FIG. 1.—*General view of the new Follsain-Wycliffe fettling shop showing the individual booths each with exhaust ducting. Trunking of the Plenum air-heating is carried along the roof apex.*

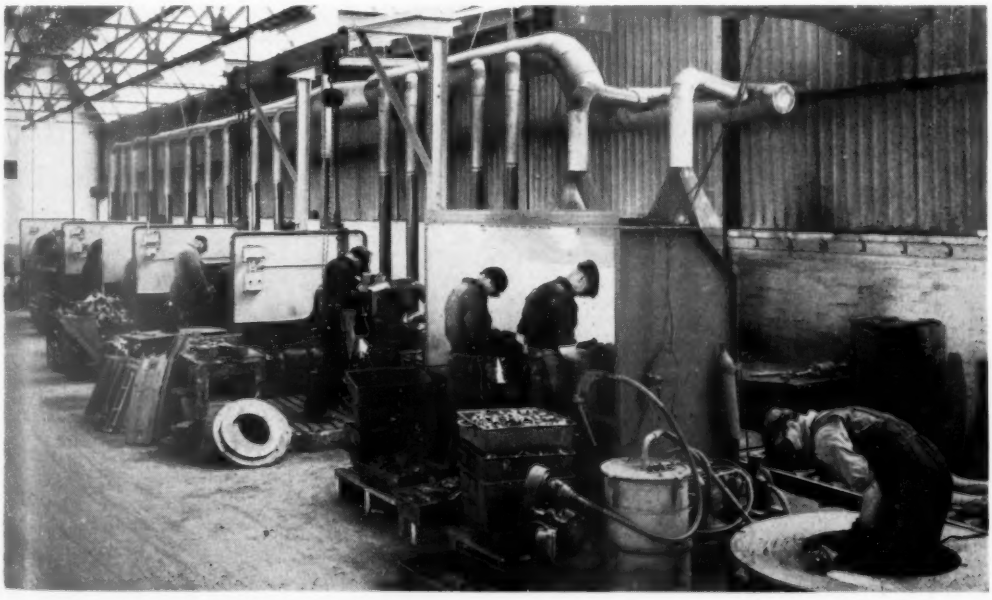


FIG. 2.—*BCIRA design of dust-extraction equipment fitted to a double-ended stand-grinder; note the experimental plastic screen between the two operating points.*

wheels of the double-ended grinders, as is shown in Fig. 2.

Despatch Section

The despatch section occupies the remaining seven bays. After inspection, the work is weighed to check fettled output, and then binned, sorted and despatched. A fall of approximately 4 ft. in ground level outside the section enables loading docks at lorry height to be self created, the shop level remaining constant throughout its length.

Dust-extraction

The dust-extraction equipment was designed to comply with the latest requirements of the Iron & Steel Foundries Regulations and the Factories Acts, the contract being carried out by Dallow Lambert, Limited, of Leicester. Extraction takes place above the grinding wheels as well as below, the BCIRA Dusgard* system being installed for the above-wheel collection, the suction being 5½ in. w.g. at the Dusgard (see Fig. 2). The system extracts 16,000 cub. ft. per min., and passes through a Drytube collector (Fig. 3), situated outside the shop. This is fitted with a manual shaking-gear, which is operated at the mid-day break, and after work at night, when the collecting hoppers are emptied.

*The British Cast Iron Research Association's design of equipment for exhausting from stand grinders is manufactured by Air Control Installations, Limited, under the trade name "Dusgard."

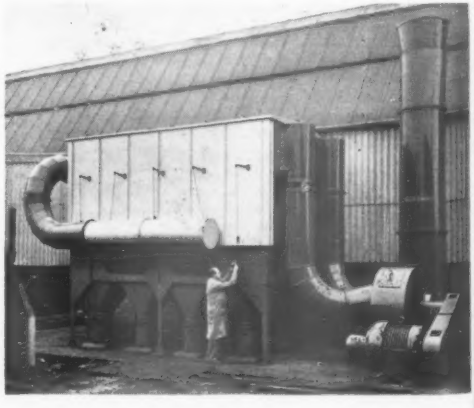
Air Heating

The high rate of extraction provides seven air changes per hr. over the whole shop (including the despatch area), and fourteen changes per hr. in the fettling area. Thus, the heating of the building, for comfort of the grinding-machine operators, presented a problem. With each wheel hood extracting some 900 cub. ft. per min., and this air passing the body of the operator, a chilling effect, and draughts, would be created. It was decided to instal a Plenum air-heating system which would introduce a volume of air comparable to that being extracted, the air being heated before release into the building. The introduction of warmed-air does not create such a tendency to cold draughts as can take place with radiation and convection heating. Designed and installed by Air Plants (Leicester), Limited, the system heats the air in a direct-fired, automatic thermostatically-controlled-stoker heat-exchanger, fed into the building at tie-bar level of the roof trusses (see Fig. 1). The system is so arranged that short circuiting can be employed during non-working hours, effecting an economy in fuel. Only clean fresh air is employed during working periods, for despite the employment of the BCIRA Dusgards, it was decided that there should be no risk of re-circulation of dust-laden air.

Machine-shop Reorganization

A further stage in works reorganization involved improvements to the main foundry and coreshop. Unfortunately, however, the works canteen was interfering with the logical development of the site. As the machine-shop was housed in a separate building, at some distance from the fettling shop, from which its work was drawn, it was decided to make one move provide the answer to both problems, *i.e.*, to gain a building for a new canteen and social centre, and to bring the machine-shop near to the fettling shop. Thus, a second building, similar in construction to the new fettling shop, was

FIG. 3.—*Drytube dust-collector to handle* 16,000 *cub. ft., located outside the new fettling shop.*



erected contiguous thereto, and access was made for the transporting of castings from the fettling-shop inspection bay directly into the new machine-shop. The machine-shop is lit by twin fluorescent tubes, and all power drops directly off bus-bar trunking. Heating is taken from the Plenum hot-air system installed in the adjoining fettling shop (see Fig. 4).

Other Amenities

Advantage was once again taken of the natural lie of the land to provide sub-basement toilet and cloakrooms, entered at ground-floor level. Following removal of the machines from their old building, this was converted into a commodious canteen and social centre, abutting the sports field, and with a bowling green alongside it. The former canteen building is now in the course of reconstruction into a new coreshop, which in turn will allow for further development of the foundry proper.

FIG. 4.—*Section of the new machine-shop at the Lutterworth works. The overhead Plenum trunking, and the twin-tube fluorescent lighting at roof level, are clearly shown.*

London Transport's Orders

An order collectively worth £3,500,000 has been placed with seven British manufacturers by London Transport as the next stage in its plans to improve Central Line travel. The orders will comprise electrical, mechanical, and other train equipment to be used in 338 new-type Central Line cars. It is intended to order the cars themselves after tests next year with three prototype trains of new rolling stock being built by Cravens, Limited, Sheffield.

Provision of 1,400 motors for the new cars by the General Electric Company, Limited, represents an order worth £1,250,000. They will be made at the company's new traction motor works at Dudley Port (Staffs) and deliveries will begin next September.

Other orders placed are:—British Thomson-Houston Company, Limited, for traction control and auxiliary equipment worth almost £1,250,000; Westinghouse Brake & Signal Company, Limited, for brake equipment and compressors worth £500,000; G. D. Peters & Company, Limited, for door equipment; A.E.C., Limited, for automatic couplers and disc connecting units; Patent Lighting Company, Limited, for auxiliary electrical equipment; and Benjamin Electric, Limited, for lighting and auxiliary equipment.

London Transport has also placed a £500,000 order with Dialoy, Limited, Cardiff, for car doors for the new rolling stock for the Piccadilly and Metropolitan lines, besides those now ordered for the Central Line.

The British Thomson-Houston Company states that it now has orders in hand for over 850 traction control equipments for London's new trains. A previous order, delivery of which is about to commence, covered 504 electro-pneumatic camshaft control equipments for new stock on the Piccadilly and Metropolitan lines. The latest order for 350 equipments for the Central Line brings the total number of this type of equipment supplied or on order from BTH to 2,226 since the first order was placed for the 1938 Tube stock. The total value of work in hand at BTH for train equipments alone for London Transport is approximately £3,000,000.

Rail-modernization Orders

Largest order to be placed by the British Transport Commission since its modernization programme was announced in 1955 is for 226 additional main-line diesel locomotives for British Railways. Of these 137 will be built in BR workshops. The total value of the contracts placed (for 89 complete units and 137 sets of engine and transmission equipment) is over £16,250,000.

The 137 locomotives will be erected at the Crewe and Derby locomotive works and will have diesel-electric transmission equipment supplied by Crompton Parkinson, Limited. Of the remaining 89, 72 will be built by the English Electric Company, Limited, and 17 by the British Thomson-Houston Company, Limited.

Diesel engines and electrical equipment for the locomotives to be supplied by English Electric will be manufactured at the company's Preston works, while work on the mechanical parts will be shared between Vulcan Foundry, Limited, Newton-le-Willows (Lancs), and Robert Stephenson & Hawthorns, Limited, Darlington, both members of the English Electric group.

Four factories in the Crompton Parkinson group will supply components for the 137 locomotives to be built in BR workshops; storage batteries coming from Newport, cables from Derby, lighting equipment from Guiseley, and all motors and generators from Chelmsford. The control gear will be built by Allen West & Company, Limited, Brighton. The Sulzer diesel engines will be built by Vickers-Armstrongs (Engineers), Limited, at Barrow-in-Furness.

Type 1 locomotives to be supplied by BTH will be fitted with Paxman engines and mechanical parts will be built by the Clayton Equipment Company, Limited.

THE BRANCH OF THE AMALGAMATED UNION OF FOUNDRY WORKERS located at Renishaw Iron Works held a tea and social evening at the New Golden Ball Hotel, Renishaw, on Saturday, February 27, to commemorate the 150th anniversary of the union. Members' wives and old-age members were among those who attended.

E

Correspondence

PRICE-CUTTING

To the Editor of the FOUNDRY TRADE JOURNAL.

SIR,—May I take up a quota of your space to make some very obvious remarks, and these involve some figures.

First look at the annual UK output of iron castings in round millions of tons.

1946.	1947.	1948.	1949.	1950.	1951.	1952.
2.5	2.8	3.3	3.4	3.5	3.7	3.8
1953.	1954.	1955.	1956.	1957.	1958.	
3.6	3.7	3.9	3.9	3.7	3.4	

Apart from a little set-back in 1953 there was a strong upward trend during the 10 years from 1946 to 1955. Obviously capacity increased during that period and human nature being what it is, it is pretty certain that by 1956 capacity greatly exceeded output. You only have to immerse a businessman in that sort of market for five years let alone 10, and he will expand capacity for the "good future" indicated by the trend. I won't try to guess what was the capacity of the industry by 1956, but I am prepared to wager it was considerably over 4,500,000 tons.

The industry comprises a great many small units, and at least a thousand of them employ fewer than 50 men. Admittedly less than half a dozen units make more than half the output but the "big chaps" don't determine market prices under normal conditions and it is market prices which interest us all at the moment.

Economists tell us that market prices are determined by operators working on the margin. A small man cutting his prices a bit gets his order book full. His orders only represent perhaps a ten-thousandths part of the whole market but the price at which he took them exerts its influence over prices for miles around. Now these small foundries are often run by a proprietor whose training has been mainly devoted to the craft and technique of founding rather than to the art and science of making money.

For at least 10 years, that type of proprietor was selling an output which grew year by year. Usually he did not try to get the highest prices he could, his absolute profits were growing even when he maintained the same margin of profit. He had enough to think about in meeting customers' delivery requirements without wondering whether he should pursue a bolder price policy. He was getting an apparently growing profit and that seemed good enough.

Rising Costs

Costs were rising all the time; and that was a nuisance because the small-foundry owner did not know much about costing and he was very glad to follow anyone else's example when wondering how much extra to ask to cover the latest wage award. Some trade associations tried to help him by calculating what the wage or material increase meant in terms of final costs or prices, but ultimately it was the man who shaved his margins a bit who got the first orders and in the end everyone reduced their margins a little. The way in which the costs of ordinary foundry materials and wages rose was really pretty staggering. An engineering casting of only medium complexity selling for about 30s. per cwt. pre-war, by 1946 had risen in cost by about 100 per cent. By 1951 this was 150 per cent.; by 1955, 200 per cent., and by 1958, 300 per cent. Thus in 20 years the price should have soared from 30s. to 120s. The figures I have just given were only estimated on the ordinary items of cost, but there is another item which usually got overlooked by the modest foundry and that was the cost of replacing plant.

If plant cost £100 in 1938, by 1948 it was over £200, by 1955 over £300, and to-day over £350. The Companies Act and the Inland Revenue both agree that the way to cost plant depreciation is to base the calculation on what the item cost when you bought it and to have no regard for what you will have to pay if you replace the machine to-morrow. In face of these authorities it is small wonder if many foundries made no allowance in their pricing sums for the extra expense that the renewal of plant was going to present some day.

To remind you of the obvious points: First by 1956 there must have been considerable spare capacity; second, during the booming market which existed until 1956 small founders were not charging the highest prices they could justify. Neither they nor their customers had really adjusted their ideas to match the rate of inflation. Let me illustrate that point.

The Board of Trade selling-price index for iron castings starts with 100 in June 1949 and rises to 145 in June 1956. Now although I have a theory that the Board of Trade index rates selling prices too high, my records on costs suggest that prices should have risen to 160 by June 1956. Thus, even if the Board's indices faithfully reflected the average experience, even they show that during those good years, from 1949 to 1956, prices compared with costs shrank by 10 per cent. Suppose prices in 1949 allowed profits of 20 per cent.—which I don't suppose they did—the prices in 1956 must have allowed profits of only 10 per cent.

Of course, it can be reasoned that the increments in wages and raw-material prices should have been partly off-set by improved techniques, better plant and better management, and I do not doubt that they were, but against that the foundry has had to face the cost of greatly-improved working conditions and has had to provide better casting. There has, I think, been an improvement in the quality of the metal and in the tolerance of the cast dimensions. It is convenient, but probably not correct, to assume that the cost of those improvements has been met exactly by greater efficiency in methods of production.

Figures, unfortunately, are little more than a means of reasoning in detail, they rarely prove anything of themselves; I have used them only to illustrate my belief that in 1957 when the recession started we had two things: surplus capacity and quite modest profits. (Neither can be measured nor estimated accurately). Now in 1957 and 1958 the inflation of costs continued very much as before but the market began to shrink, the figures being: 1956 output 100, 1957, 95 and 1958, 87 per cent.

If the third quarter of 1958 is compared with the third quarter of 1956 the index is about 86 per cent. whilst the fourth quarter of 1958 shows about 84 per cent. In other words, there has been a recession. In some parts of the country output seems to have fallen as much as 30 per cent. but the national figures suggest a drop of 16 per cent., and such a drop in total sales should not normally have serious consequences. If selling prices keep pace with inflation the drop in sales reduces the rate of profit per sale (because overheads are spread over a smaller output) and in addition, of course, the reduced profit rate is applied to a reduced turnover. The effect of 16 per cent. market shrinkage can, therefore, be quite unpleasant but should not be very serious.

In the foundry industry, however, it is serious. It is serious because the remedy which seems right for one firm is clearly wrong for all firms. Two factors

aggravated the wave of price-cutting which started seriously in 1958. There was a surplus capacity of mechanized foundries—and a mechanized foundry is a most efficient producer of losses unless it is kept busy. Even the boom in the automobile industry has been insufficient to keep all mechanized foundries busy so their managers had to get orders at any price.

The small founder does not, of course, suffer from the critical capacity problem so acutely but he has his own handicap. Compared with his customers he is financially small; his sales department, if it exists, is not highly organized and at the first hint of spare capacity the large buyers begin to play one small founder off against another. It takes a stout-hearted man to maintain prices when orders are going elsewhere and it takes financial backing to keep the business alive. In the autumn of 1958, when wage rates increased, higher prices should have been charged.

Despite these difficulties a number of founders in different parts of the country did try to maintain, and even to raise, prices in 1958. The industry's prices, however, are like a series of inter-connected tanks. When the level is lowered in one it eventually lowers the level of the others. There are no stop cocks in the connecting pipes, no watertight markets. When a foundry cannot get enough of its traditional work it will hold itself ready to cast almost anything. This advantageous adaptability can be a grave weakness. Some one punctures a small hole in the price level of say, machine-tool castings, and the level of prices falls for agricultural castings, switchboxes and the rest.

The demand for iron castings as a whole seems to be fairly inelastic in relation to price and even if the whole industry lowers its prices drastically there does not appear to be a corresponding upsurge in demand. In saying this I have no sort of proof to offer.

Have Founders Attempted Economies?

Turn now for a moment to another point. Have founders attempted to effect economies in operation? An almost impossible question to answer with the few statistics available. However, one example can be illustrated with figures. The engineering and jobbing section of the industry in 1956 consumed in its average mixture 46 per cent. pig-iron and 54 per cent. scrap. In 1957, the pig-iron moved down to 43 per cent. and scrap up to 57 per cent. In the September quarter, 1958, pig-iron fell to 38 per cent. and the scrap rose to 62 per cent. There was no shortage of pig-iron and customers did not suddenly specify a lower grade of metal. In fact they probably received a consistent quality of cast iron and the change simply illustrates clearly the effort to reduce costs. That effort to economize probably ranged over the whole field of possible savings.

For the past 18 months there has been a steady flow of reports of foundries closing. Viewed objectively, this reduction of capacity is no doubt good for the industry. The probability is, however, that for every foundry which closes there are a dozen which feel a severe financial pinch.

The need to develop new techniques, new grades of iron, and to replace obsolete plant, and to maintain good or better working conditions requires money; this must come from sales, and prices must be restored. Is there any way in which the foundry manager can be stopped from running down this steep slope? Will you, Sir, through the influence of your columns repeat for the benefit of founder and customer alike, that this industry will not be equipped with suitable men and plant a few years' hence if prices are not restored.

Yours, etc.,

G. B. JUDD.

25, Bridle Road, Purley, Surrey.

PRICE-CUTTING

To the Editor of the FOUNDRY TRADE JOURNAL

SIR,—During the past twelve months, the machine-tool and engineering foundries in particular, have suffered a very considerable recession in trade. The result has been that many of the "tied" foundries have been proved to be uneconomical and have been closed; some of the smaller foundries, less able to meet the constantly rising standards of the industry have similarly closed, and those foundries remaining in business have found competition extremely keen.

Personal experience has been that in many cases, founders who should certainly know better, have indulged in the suicidal policy of chopping prices to what is quite obviously an uneconomical level. My firm has frequently been faced with quotations which are so obviously below the cost of material and labour, that we thought such should be brought to the attention of all and sundry.

The manufacture of castings, particularly in the engineering and machine-tool industries, is a highly-skilled craft and as such, its personnel should have sufficient dignity to keep a level head even when times are difficult.

Straightforward and clean competition is, of course, essential, but this ridiculous practice of quoting prices which quite obviously do not allow the recovery of material and labour costs can only have catastrophic results for the whole industry.—Yours, etc.,

C. REYNOLDS.
Director.

Newcast Foundries, Limited,
Newcastle-under-Lyme, Staffs.

This letter has been somewhat abridged.—Editor.

ONE-MAN CUPOLA CHARGING OUT-DATED?

To the Editor of the FOUNDRY TRADE JOURNAL

SIR,—In the JOURNAL of January 30, 1958, there was published my letter concerning mechanical charging of cupolas and mention was made of a particular layout which this company had developed, which permitted the whole of the charging operations to be carried out by one man.

The writer recently visited one of the foundries at which this particular equipment is installed, and found that the one man who performs the charging operations—and who is 62 years old—had recently suffered (not while at work) an injury to his right arm with the result that it was completely out of action. In spite of this he was performing his duties without the slightest difficulty and in fact was highly delighted that the special equipment installed made it possible for him to carry out a full day's work at full pay, whereas under the previous circumstances he would obviously have been placed on the "sick list."

It rather looks as if one-man charging is out-dated, and that the job can now be done by "half a man!"

Yours, etc.,

J. H. GRAINGER.
Executive Director (Sales).

Constructional Engineering Company, Limited,
Charles Henry Street, Birmingham 12.

THE PRODUCTION OF IRON CASTINGS (grey and malleable) in the UK in 1958 was 3,468,600 tons (for 53 weeks) as compared with last year's total of 3,715,100 tons. Detailed statistics will be published in next week's JOURNAL.

American Letter

Effect of Molybdenum on Grey Iron at Elevated Temperatures*

The effect of up to 2½ per cent. molybdenum on the short-time tensile and stress/rupture properties of a grey iron having a CE (carbon equivalent) value of 3.8 per cent. has been determined by various additions of that alloy to two base irons of 3.0 to 3.30 TC and 1.8 to 2.0 Si; one of them with usual amounts of other elements; and the other containing approximately 0.60 per cent. chromium.

A Class 40† grey iron was employed as the base material and molybdenum additions up to 2.5 per cent. were made to the two series (*i.e.*, with and without the 0.60 per cent. chromium. The high-temperature tests conducted on these irons were limited to short-time tensile tests, and stress/rupture tests up to a fracture time of 100 hr.‡ The iron was melted in a cupola, transferred to an electric-arc furnace for holding and pre-heating, and alloyed as required by additions to the pouring ladles. The pouring temperature was approximately 2,600 deg. F. The test-bars employed in this investigation were cast as 1.2-in. dia., 6-in. long bars from a central runner that also served as a feeder, the mould being of dried core-sand. The tests were performed on tensile bars machined to 0.505-in. dia.

The molybdenum content was varied in steps of 0, 0.25, 0.50, 0.75, 1.00, 1.50, 2.00 and 2.50 per cent., first in the base-iron, and then the chromium iron. Bars containing the three largest amounts of molybden in the chromium series, and those with the two highest molybdenum contents in the plain series, were annealed at 760 deg. C. for 1½ hr. before machining, in order to soften the matrix to some extent, which brought the hardness down from 330-380 to 260-280 BHN.

Short-time Tensile Tests

Short-time tensile tests were conducted at room temperature, 425, 540 and 650 deg. C., the stress/rupture strength being measured for fracture times up to 100 hr. at 425, 540 and 650 deg. C. The first series of tests indicated that increasing molybdenum content increased the strength of the plain, and 0.60 per cent., chromium grey irons to a maximum value at 1.4 to 1.9 per cent molybdenum. The maximum strength for the molybdenum irons rose with increasing molybdenum to 31.2 tons per sq. in. tensile at room temperature. At 425 deg. C. it dropped to 28.1 tons per sq. in.; at 540 deg C. to 25.9 tons per sq. in.. and at 650 deg. C. to 12.9 tons per sq. in. In the molybdenum/chromium irons, the corresponding values were 425 deg. C., 24.5; 540 deg. C., 21.0, and 650 deg. C., 11.6 tons per sq. in. respectively.

The stress/rupture strength decreased uniformly with increasing time of testing up to 100 hr. for all irons, but a more-rapid loss in strength with increasing time was evident at the higher testing temperatures. These properties of the irons containing chromium were superior to the straight molybdenum irons for all compositions at 650 deg. C., and for those irons having less than 1.5 per cent. molybdenum at 425 and 540 deg. C.

The rupture strength of the chromium irons with high molybdenum contents at 425 and 540 deg. C. was reduced below the values for the comparable straight molybdenum irons by the presence of massive cementite in the microstructure. Metallographic examinations of the irons before and after the 100-hr. stress-rupture testing indicated some bainitic decomposition at 425 deg. C.; all bainites were decomposed at 540 deg. C., and all bainites and pearlites were agglomerated and spheroidized at 650 deg. C.

Iron-ore Statistics

Consumption of iron ore in the United States last year decreased approximately 28 per cent. from 1957. The total in 1958, according to the American Iron Ore Association, was 90,000,000 gross tons, compared with 125,000,000 in the previous year. This reduction corresponded with a similar decrease in pig-iron, ingot-steel and ferrous-materials usage.

Stocks of ore on hand at furnace yards and docks at the end of 1958 amounted to 66,000,000 tons, about 1,800,000 higher than a year earlier, and equal to nearly seven months' consumption at the December rate of almost 9,600,000 tons monthly.

The consumption of ores from the various major sources is shown in Table 1. Ores from Lake Superior account for more than 55 per cent. of the total. The use of these ores was reduced by approximately one-third, whilst Canadian ores went down 22 per cent., and other foreign ores 17 per cent.

TABLE 1.—*Total Annual Consumption of Iron Ore.*
(Thousands of Tons.)

Source.	Year. 1957.	1958.
United States		
Lake Superior	74,685	50,494
Other US	19,836	14,513
Canada		
Lake Superior	3,079	2,050
Other Canadian	7,997	6,605
Foreign	19,345	16,120
Total	124,942	89,782

GM Develop Cylinder-wall Thickness Gauge

General Motors' process-development staff have designed an ultrasonic gauge that simplifies the measurement of 0.001-in. variations in cylinder-wall thickness. This device will improve quality control of car-engine castings. According to Robert B. Colten, head of the electronics department, the device utilizes the principle of the ultrasonic resonance and can be adapted to measure the thickness of straight or curved surfaces of cast iron; steel; aluminium; magnesium; brass; lead: glass, and most solid plastics (even with only one side of the material accessible).

The tester does not require a specially-trained operator. When it "decides" that cylinder-wall thickness is substandard, or too thin, a red light flashes on. The gauge was specially developed at the request of the General Motors' foundries, because it was found that cores sometimes shift slightly during casting, which affects the critical thickness of cylinder walls. Over-all accuracy of the instrument is within 2 per cent. of the full-scale reading. A typical thickness range of cast iron measured is 0.075 to 0.300 in.

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* Synopsis of a paper, by G. K. Turnbull and J. F. Wallace, which is to be presented at the forthcoming AFS Congress in Chicago (April 13-17). Of the authors, G. K. Turnbull is research assistant, and J. F. Wallace is associate professor, department of metallurgical engineering, Case Institute of Technology, Cleveland, Ohio.

† The Class 40 iron probably refers to ASTM specification 278-56, class 40 (for pressure-containing parts for use at 450 to 650 deg. F.). Minimum tensile strength called for is 40,000 lb. per sq. in. (17.8 tons per sq. in.), with CE 3.8 max.; P 0.25 max., and S 0.12 max. per cent. Castings and bars must be stress-relief heat-treated. The alloy is designed for valve bodies, paper-mill drier rolls and chemical process equipment.

‡ Stress rupture tests of 100-hr. duration are not considered adequate for predicting the "long term" performance of materials at elevated temperatures.

Trends in Cast-iron Enamelling

Realistic Survey of Present Status and Future Potentialities, discussed by members of the Southern section of the IVE

The JOURNAL'S representative was present at a recent meeting of the Southern section of the Institute of Vitreous Enamellers, at which Mr. J. Bernstein (Simplex Electric Company, Limited) gave a paper entitled "The Future of Cast Iron for Vitreous Enamelling." Held under the chairmanship of Mr. C. P. Stokes, at the Howard Hotel, Norfolk Street, London, W.C.2, the meeting was attended by about 30 members.

Mr. Bernstein commenced by remarking that trends in industry seemed to move in a sort of cycle, returning inevitably to the starting point, no matter what advances in science or production methods were made in the interim. He said that he hoped to see this kind of thing happen in the cooking-stove industry, with which his lecture was to be concerned. He then began his paper, illustrating his points with lantern slides.

Cast Iron in Cookers

The first series of slides were of various types of cooker, and showed how the current trend, away from solidity and permanence, and towards lightness and eye-appeal, had adversely affected the amount of cast iron used in the stoves, and consequently the amount of vitreous enamelling of cast iron necessary. Mr. Bernstein emphasized this point by quoting some surprising statistics. Around 1910, he said, cookers weighed no less than 210 lb., of which 90 lb. was cast iron, 65 lb. of this being vitreous enamelled. To-day, however, a typical stove weight was 144 lb., of which only 8 lb.—the hotplates—was cast iron. The stove hob was indeed enamelled, but was not made of cast iron. To allow his audience to recover from this somewhat disconcerting revelation, Mr. Bernstein concluded this series of slides with one of a very attractive young lady; there was, however, a stove in the background, just to be consistent!

Cast Iron in other Industries

Mr. Bernstein continued that, although he did not despair of a recovery by cast iron in the cooker industry, it would be a good thing if new fields for the use of cast iron were investigated, to counteract the present state of affairs. He stressed potentialities in this sphere with a second series of slides, which showed instances where enamelled cast iron had ousted all other materials in the production of various articles. Amongst these were: weighing-machine dials; cattle troughs (for which cast iron was ideally suited); chimney pipes (here there was hardly any competition from other materials), and cisterns, many of which were produced in white vitreous-enamelled iron in spite of the competition from porcelain. Cast iron was also firmly entrenched, he said, in the electrical-fittings, chemical, cooking-utensils, and heavy electric-fire industries.

Technical Problems

Mr. Bernstein's third series of slides dealt with technical problems encountered in enamelling cast iron. Amongst points discussed here, and demonstrated with slides, were the effect of different freezing rates on metal quality; the necessity to blow castings clean of shotblast powder before filling; the thickness of enamel necessary with various colours, and whether an undercoat was desirable with colours other than white.

Conclusion

Mr. Bernstein concluded his lecture by saying that, in his opinion, cast iron would always hold its own because of its strength, and that vitreous enamelling of cast iron gave a superior finish to that obtained using paint. Vitreous enamelling was also more economical, due to the high rejection rate usual when paint finishes were given their final inspection.

DISCUSSION

In the discussion which followed the presentation of the paper, several interesting points were raised, amongst them:

DR. B. K. NIKLEWSKI said that many European manufacturers were reluctant to use vitreous-enamelled cast-iron because of the varying results caused by differing gas content of the iron. What was the author's opinion of this prejudice?

The AUTHOR replied that the amount of gas dissolved in cast iron was, in his opinion, low, and that if fixed production procedures were consistently followed no real problem existed. In any case, he said, steel, which was a main competitor of cast iron, contained gas in similar amounts.

MR. J. SEMPLE asked if better enamelling resulted when free carbon was first removed.

The AUTHOR admitted that the risk of gas evolution was reduced if carbon was removed, but pointed out that decarburization by annealing just wasn't economical, since one-hour's anneal per 0.001 in. of material section was needed to shift the carbon.

MR. R. JONES asked if the author thought undercoats were really necessary on cast iron.

The AUTHOR conceded that white enamel *could* be applied direct, although he thought the resulting opacity left something to be desired. In general, however, undercoats were definitely necessary. He reminded Mr. Jones that the creams of today, for instance, were *true* creams, not mottled as in the past, and said that they certainly needed undercoats. Undercoats were a good thing, also, because of their excellent effect in reducing the rejection rate.

Cast-iron Fire-marks

In the days before public fire brigades, the insurance companies had their own fire engines and firemen to attend fires in premises covered by them. A means of identification was therefore required, to ensure that their fire service was rendered only to their policy holders, so plaques (called fire-marks) were erected on the walls of insured buildings. Many of these date from the 18th century and are made of various materials such as copper, lead, cast-iron, and terra-cotta, etc. Those of cast-iron are now rare, and one was recently sold to a collector for £20.

One fire-mark, belonging to the "Hand in Hand," dates from 1696, and is a very rare specimen, incorporating in its design hands clasped below a crown. All

FIG. 1.—*Fire-mark of "The Shamrock" insurance company.*

fire-marks were embellished with various designs, or business marks of the respective companies, some being heraldic. One of the finest examples of a cast-iron mark is that shown in Fig. 1, which belonged to "The Shamrock" insurance company, which was wound up in 1825. Fire-marks continued to be used in this country up to the close of the last century, and, indeed, some are still to be seen in Egypt and Greece.

Metal Industries' New Subsidiary

To co-ordinate the European activities of its electrical subsidiary, Brookhirst Igranic, Limited, Metal Industries, Limited, has formed a new company—Brookhirst Igranic (Europe), Limited. With a share capital of 10,000,000 (Belgian) fcs. (about £70,000), the new company will be concerned with market research and sales and service throughout western Europe and, in particular, the Benelux countries.

First chairman is Mr. John Black, deputy chairman of Metal Industries, and the deputy chairman is M. H. Derboven, a Belgian banker. Other directors are Mr. H. O. Houchen, managing director of Brookhirst Igranic, and Mr. R. H. Frings, who has represented Brookhirst Igranic in Brussels for many years.

Electrical Engineers' Exhibition

Lord Brabazon of Tara will open the Electrical Engineers' (ASEE) Exhibition at noon on March 17 at Earls Court, London. There will be over 430 exhibitors and the exhibition will last till March 21.

BIM Conference

Addressing the closing session of the British Institute of Management two-day conference at Leamington, on February 26 and 27, the Earl of Verulam said that in spite of the rebuffs which politicians' experienced in Moscow, British industry should not ignore trade prospects with Communist countries. He mentioned that his own firm, Enfield Rolling Mills, Limited, of which he is chairman, had done more than half the total business transacted by Britain with the Soviet Union, directly or indirectly "because we happen to make the right products." Lord Verulam added that there was more business coming, but it would come at the moment when the Russians wanted to place it, and not when the British manufacturers wanted to get it. Lord Verulam advised British firms not to ignore even the smallest markets such as the Falkland Islands, British Guiana and Hong Kong, which could have astonishing potentials with the right timing in trade.

Common Market

At an earlier session of the conference, Mr. J. H. Lord, director of the Dunlop Rubber Company, Limited, said that British industry must use its capital in the Common Market wisely and on an increased scale. The Americans were investing in the Benelux countries and Germany and now in France as well. In view of the Common Market, Mr. Lord said he would be surprised if the Americans did not continue to invest in Europe on an increasing scale rather than invest in Britain. "Unless and until the present economic partition of the United Kingdom from the Common Market is overcome the danger is not so much the loss of exports to Europe but that our own export world will be threatened by the European combines and their mass-production power," he concluded.

Foamed Aluminium Castings

The February issue of *Modern Castings* contains an article on foamed aluminium. It tells of castings, made by the Foamalum Corporation of La Salle, Illinois, the density of which, controlled by varying the addition of foaming agents, can range from 12 to 70 lb. per cub. ft., compared with that of ingot aluminium of 166 lb. per cub. ft. No information is given as to the nature of the foaming agents used. The cast material, which floats in water, is said to have potential applications in the marine, aircraft, missile, motor-car and construction industries. The president of the Foamalum concern, Mr. J. R. Kreigh, *proudly* claims that he makes the most porous castings in the world—a claim that most other foundrymen would not care to challenge!

Magnesium Price Reduction

Following on the recent reduction in the price of pure magnesium, Magnesium Elektron, Limited, announce that the price of some of their magnesium-alloy ingots has been reduced. The new price became effective on February 15. The announcement is in keeping with the company's policy to encourage and develop large-scale commercial use of the metal by cutting down the price differential between magnesium and its competitors. Magnesium offers advantages over most metals used for die-castings.

Notes from the Branches

South Africa

The 1959 syllabus of meetings of the South African branch of the Institute of British Foundrymen includes a list of local members. This discloses that the branch has 43 subscribing firms, two honorary members, 135 members, 124 associate members and 22 associates on its roll, which represents a very substantial increase in recent years.

In addition to the usual series of evening meetings scheduled to take place in Johannesburg, the first whole-day conference of the branch is also announced. It is to take place in the Wanderers' Club, Johannesburg, on March 19, and four papers are to be presented.

For a lecture, to be given in Pretoria (in April) the secretary, Mr. J. Steele, has chosen a pretty piece of alliteration for his title "Massive Monument made by Ancient and Modern Moulding Methods." Two works visits are scheduled, the first to Iscor in February, and the second to the Consolidated Glass Works' sand-washing plant, etc., in May. A social evening, an annual dinner, a report on last year's annual meeting, and notes on awards coming under the jurisdiction of the branch conclude the booklet's main coverage of branch affairs.

Durban Activity

There is news, however, of exploratory meetings arranged with a view to extending IBF activities in Durban. Here, a provisional committee under the chairmanship of Mr. J. Robertson, and secretaryship of Mr. J. H. Richmond (P.O. Box 1377, Durban) has fixed up three meetings and a works visit for the current session.

Slough Section

On Tuesday, February 17 in the Lecture Theatre, High Duty Alloys, Limited, the Slough section held their February meeting, under the chairmanship of Mr. P. Hoesli, section president. The weather was not kind; thick fog prevailed and was the cause of attendance being down to a mere 17. This did not, however, perturb the lecturer, Mr. B. Levy of B. Levy & Company (Patterns), Limited, who brought to Slough members a very interesting paper entitled "Patternmaking Progress." In his paper, Mr. Levy dealt with a range of pattern equipment for use on various metals such as grey-iron, gunmetal, aluminium, etc., and elaborated on each particular set of equipment in its turn. An excellent set of slides was used to illustrate each pattern, corebox, etc. One could feel when listening to Mr. Levy that his interests in patternmaking had been with him over the years, and that he was fully prepared to call upon his personal experiences to give added interest to the lecture. He discussed the versatility of the present-day patternshop, and illustrated examples varying from wooden patterns of the simplest kind to large fully-machined metal equipment, some of which weighed up to as much as one ton in weight.

Summing Up

Mr. Levy talked of the modern machines that have to be carried by the present-day patternshop, and of the accuracies expected when working with them—micrometers, verniers, dial gauges, etc., being the order of the day. The machine to which most emphasis was given—in fact the lecturer brought with him his own film of one such machine— was the Hydro-Copy-Miller, which is capable of reproducing from a master pattern to an accuracy of 0.003 in. any machinable material, including the toughest steel. To sum up his paper, Mr. Levy made the following remarks; the modern patternmaker should have skill and knowledge of at least *some* metal work; he should make himself familiar with instruments such as micrometers, verniers and dial-gauges, also because of the tendency for even small quantities of castings to be mechanically produced, he should acquire a thorough knowledge of moulding methods, machines, and runner systems for various metals. His last remark was addressed to moulders and foundrymen, and he said he felt every moulder should be able to read and plan from a drawing, thus saving much trouble and time after the pattern was produced.

In the very lively discussion which followed presentation of the paper, the last comment brought forth some interesting remarks from the foundrymen in the audience. The cry was for isometric drawings of the casting required in place of the orthographic drawing used by engineering drawing offices. This it was felt would be the solution to all the differences that from time to time arise between the patternmaker and the moulder. It was not, however, decided who should be responsible for producing this drawing.

A very interesting evening was concluded by Mr. H. J. Proffitt who was pleased to propose the vote of thanks to Mr. Levy for his excellent paper and film.

New Washrooms at Ley's

Mr. F. D. Ley, managing director of Ley's Malleable Castings Company, Limited, on February 25, opened new £30,000 baths for foundry workers at the factory in Colombo Street, Derby. The new building has taken a year to construct, and the additional facilities, together with the existing baths opened several years ago, provide amenities for about 800 workers. The changing rooms are fitted with individual lockers, to which heating ducts are fitted for drying and airing clothes, two lockers being provided for each man. The walls are lined with white tiles and the bathrooms are fitted with modern showers and wash basins. The firm has spent a total of £52,000 for the provision of baths in the new mechanized plant and other foundries.

ECSC and Britain Discuss Coal/Steel Situation

The Council of Association between the United Kingdom and the European Coal and Steel Community met in Luxembourg on February 25, to discuss the current coal and steel market situation in the UK and the Community. One of the major questions on which consultations took place were the measures recently taken by the German Government to restrict coal imports from non-member countries of the Community. A report on this subject was presented to the Council by its Trade Relations Committee, which met the previous day in Luxembourg.

The Rt. Hon. Lord Mills, Minister of Power, led the UK delegation, which included Mr. J. K. Vaughan-Morgan, M.P., Minister of State, Board of Trade, Sir James Bowman, chairman of the National Coal Board, and Sir Archibald Forbes, chairman of the Iron and Steel Board. The High Authority was represented by its president, Mr. Paul Finet who led the delegation, vice-president, Dirk Spierenburg, and Mr. Albert Coppé and Mr. Franz Blücher, members of the High Authority.

It was the eighth plenary session of the Council of Association since the coming into force, on September 23, 1955, of the Agreement of Association between the British Government and the High Authority of the European Coal and Steel Community.

News in Brief

DOUGHTY SCHOFIELD FRAN SUTTON & ASSOCIATES, Crossway House, Bracknell, Berkshire, have established themselves as design consultants.

ADVANCE MOTOR SUPPLIES, LIMITED, have opened a new branch in Liverpool. This branch, at 96, Duke Street, Liverpool, 1, is managed by Mr. J. G. Lyons.

GENERAL ELECTRIC COMPANY, LIMITED, are to supply diesel-electric propulsion equipment for the new grab dredger, of 2,200 tons capacity, to be built by Ferguson Bros. Limited, Port Glasgow, for the Mersey Docks & Harbour Board.

WILLIAM HUME & COMPANY, LIMITED, brass-founders and coppersmiths, of Glasgow, is to transfer its business to Greenock, having acquired an old tan works at Ladyburn. Plans for reconstruction, estimated at £20,000, have been approved.

RAILWAY WORKSHOPS at Kilmarnock and Inverness are to be closed by the British Transport Commission. Seventy men are employed at Kilmarnock, and at Inverness about 80 men will be affected. The Kilmarnock men are to protest against the decision.

THE TRADERS ROAD TRANSPORT ASSOCIATION have this week despatched about half-a-million leaflets to interested parties. The leaflet is entitled "A Voluntary Code of Behaviour." Retailers and their suppliers can, by following its precepts, do much to ease traffic on busy roads.

THE AMERICAN WELDING SOCIETY is to hold its fortieth annual convention and show in Chicago this year. Headquarters will be at the Sherman Hotel, where technical sessions will be held from April 6 to 10, whilst the show, which opens in April 7, will be at the International Amphitheatre.

RANSOME & MARLES BEARING COMPANY, LIMITED, Newark, Nottinghamshire, are to manufacture in Australia. About 200 Australian operatives will be employed in the first stage of development. The company's chairman is Mr. Edward Senior, a former Sheffield Master Cutler.

WITH THE JANUARY ISSUE *La Metallurgia Italiana* celebrates the 50th year of publication. The journal has invariably maintained a high standard in the publication of metallurgical research work and to the Editor and his colleagues the JOURNAL offers congratulations on their golden jubilee.

HARRIS & BAILEY, LIMITED, 105, Lower Addiscombe Road, Croydon, announce that the company has been appointed official stockists by Morgan Refractories, Limited, of Neston, Cheshire. The sales area is south of a line from the Wash to the Severn, excluding the counties of Gloucestershire and Wiltshire.

BROOM & WADE, LIMITED, have recently formed, in Belgium, Broomwade-Belge S.A., to further their export trade. This company was constituted on February 20 with a capital of 4,500,000 francs (about £4,000). The directors are:—Mr. H. S. "Dick" Broom, M.B.E., B.SC., Mr. C. Broom Smith, J.P., and Mr. J. E. Bambrough.

AN EXPORT ORDER for iron pipes for use in water undertakings, valued at about £50,000, for the Government of Ceylon has been secured by Clay Cross (Iron & Foundries), Limited, Chesterfield. Mr. J. G. C. Jackson (works director) and Mr. J. D. Silk (commercial manager) are going to Ceylon in connection with the transaction.

VICKERS-ARMSTRONGS (TRACTORS), LIMITED, has received a £75,000 order from the Army for the supply of 60 Vickers Vigor tractors. This is one of the biggest orders for earth-moving equipment to be placed since the war. The Vickers Vigor is already in Army service and is being used in the Malayan jungle in making a 64-mile road.

THE £40,000,000 CHAPELCROSS ATOM PLANT at Annan near Dumfries, is to be opened on May 2. It is expected that two of the four reactors at Chapelcross will be working by then, and that the plant will be in full operation by December. Sir Edwin Plowden, chairman of the UK Atomic Energy Authority, hopes to be present at the ceremony.

GUEST, KEEN & NETTLEFOLDS GROUP'S stand at the Leipzig International Trade Fair (finishing the 10th of this month), is showing a range of specialized GKN equipment: a spark machine; paint-spraying plant; industrial drying ovens, and welding equipment. The stand is one of the largest in the British Pavilion and covers an area of some 150 sq. yd.

AN ORDER estimated to be worth £4,500,000 for three new cargo liners has been placed on the Clyde—at a time when the boilermakers have banned all overtime. The three new ships are to be built by Charles Connell & Company, Limited, Glasgow, for the Ben Line Steamers, Limited, Leith. They will be similar to the 10,926-ton Benloyal, which is leaving on her maiden voyage to the Far East.

IN ANNOUNCING that Mr. B. G. FitzSimon has been appointed production engineer at its Brighton plant, West Instrument, Limited, temperature-control instrument manufacturers, also announce that the company has taken over an additional 4,000 ft. of production space adjoining the main factory at Brighton. This is a temporary measure pending the opening of a new factory scheduled for completion next year.

THE REFRACTORIES ASSOCIATION of Great Britain has received armorial ensigns from the College of Heralds. The Latin motto in translation is: "Not broken by fire." The Association's shield has an arch of firebricks representing a furnace, a sun in splendour representing heat, with drops of steel in between. Surmounting is another furnace, topped by a salamander, a legendary creature which could exist in fire.

NOTICES WERE POSTED in the Brechin factory of the Coventry Gauge & Tool Company, Limited, on February 25, announcing that following the shut-down of the Arbroath factory, the Brechin works would not close, but between 30 and 40 non-essential workers are to be paid off as an "economy measure." The factory's 350 producer employees are not affected and the management hope to reintroduce a five-day week throughout the whole works soon.

THE BRITISH AND AMERICAN SHARES of British Mono-Rail, Limited, Wakefield Road, Brighouse, Yorks. have been acquired by Herbert Morris, Limited, of Loughborough. Mr. Frank Morris, chairman of the Herbert Morris group of companies, has been appointed chairman of British MonoRail, Limited, and directors include Mr. E. Russell and Mr. G. Randsley of the board of Herbert Morris. Mr. James Dallas, managing director of British MonoRail, Limited, will continue in that appointment.

ALTHOUGH THE announcement of the far-reaching plans of British Railways (London Midland Region) to improve freight transport was made only three weeks ago, work has already begun on the building of new sheds for outward goods traffic at Manchester and Chester and on a new parcels depot at Oldham Clegg Street. Building of 13 similar depots in other parts of

(*Continued on page* 280)

The Key to Progress

Supinol Core Binders will serve you faithfully at all times and will prove a special boon to you if high standards have to be achieved and maintained and if *costs* are important.

Supinol Core Binders are the result of constant scientific research and development, of strict laboratory and production control and of understanding foundrymen's needs and problems. In this age of science Supinol Core Binders play their rightful part.

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MANUFACTURERS OF

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News in Brief

(*Continued from page* 278)

the London Midland Region and at two marshalling yards will begin soon. In all some £5,500,000 is to be invested on these projects.

SIR HUGH BEAVER, chairman of the Industrial Fund for the Advancement of Scientific Education in Schools, opened the new £57,000 science building at Ashville College, Harrogate, on February 21. The Fund had made a grant of £18,000 towards the building and £1,100 towards equipment. Sir Hugh said, "This is an age when we must make the maximum use of our scientific potential. We are not training as many scientists as Russia and America and for that reason the Industrial Fund was started."

NATIONAL STEEL FOUNDRY (1914), LIMITED, Leven, Fife, has gained the first contract of its kind to be won by a Scottish foundry. The order is for a range of valves for an oil pipeline in the Manchester district, which will lead oil from ships docking at Manchester to one of the Shell refineries. The immediate order is for 100 valves, the first 24 of which are completed, and the remaining 80 valves are to be produced in the next four weeks. If the delivery dates are satisfactory, a further order for 32 valves will be placed.

THE COUNCIL OF THE REFRACTORIES ASSOCIATION OF GREAT BRITAIN has approved of the raising of a fund to provide an annual lecture to commemorate the work of the late Mr. F. S. Russell—a founder of the Association some 40 years ago. Mr. Russell who died 15 years ago, was extremely popular in foundry circles. He formed the Lancastria Club amongst those who visited an American convention in 1926 and travelled by s.s. Lancastria. This international dining and wining club flourished until the outbreak of the second world war.

FABREX TOOLS, LIMITED, Sheffield, has been formed with a capital of £20,000 to carry on the business of tool and iron and steel manufacturers. All the directors are directors of C. & J. Hampton, Limited, and Record Tool Company, Limited, toolmakers, Sheffield. They are Mr. Anthony B. Hampton, Colonel C. R. Hodgson, Mr. M. A. Alexander and Mr. Peter Woolass. The name of the new firm has been taken from the South African firm of Fabrex, Limited, vice makers, bought recently by Hamptons and now operated in Johannesburg as Hampton's subsidiary, Record Tools Proprietary, Limited.

ENGLISH STEEL CASTINGS CORPORATION, LIMITED, Sheffield, has despatched the first of two pairs of cast-steel steam-turbine casings to be used for the two single-axis turbine generators, stated to be the largest ever built by Metropolitan-Vickers Electrical Company, Limited. Destined for the new Trentside power-station, Willington "B," the castings are nearly twice the size and weight of any turbine casing previously made by the Corporation in Sheffield. They have been subjected to X-ray, gamma-ray and ultrasonic crack-detection tests. The second pair, now being fettled and pickled, are to be delivered in August. The generators are rated at 200,000 kw, and 3,000 revolutions per minute.

THE FIRST COILS OF TINPLATE to be produced in this country have been made at the Velindre Works of the Steel Company of Wales. So far about 100 tons of strip tinplate in coil form have been despatched to customers. When the No. 2 electrolytic tinning line was installed at Velindre it was equipped with twin recoilers situated immediately following the drive bridle. These have now been brought into use and are ready to supply the demand for coils which is expected to increase as more users of tinplate equip their works with coil-handling equipment. At present only a few companies have the necessary facilities to handle coils, but it is understood that others are planning to include such equipment in proposed new plants.

THE PROPOSAL to form an Industrial Safety (Personal Equipment) Manufacturers' Association has now reached the stage that firms eligible for membership are being circularized. Membership of the Association is confined to persons, firms and companies who manufacture, in the United Kingdom, articles coming within the description of "personal safety equipment." For this purpose, the term "manufacture" includes assembly, provided that some substantial portion of the finished article is fabricated, or designed, by the applicant, who has a proprietary right in the sale of the finished product. It is easy at this stage to overlook some firms coming within the scope of this definition, and the organizers have asked the JOURNAL to inform any firm not so far in touch with this effort to write to either the National Union of Manufacturers, 6, Holborn Viaduct, London, E.C.1, or to Mr. E. Roy Mullins, Parmelee (G.B.), Limited, Bedford Avenue, Trading Estate, Slough.

Obituary

Mr. ERNEST S. RUSSELL, who for nearly 30 years carried on business as an ironfounder at Kidderminster (Worcs), has died at the age of 55

Capt. (E) GERALD R. COOK, RN (Retd.), London manager of Cockburns, Limited, engineers, valve and spring makers, of Glasgow, has died.

Mr. JOHN IRVINE ELDER, a director of William Elder & Sons, Limited, agricultural engineers and ironfounders, of Berwick-on-Tweed (Northumberland), died on February 20. He was 70.

Lord STRATHCONA AND MOUNT ROYAL, who died recently, was a director of Le Grand Sutcliff & Gell, Limited, oilfield equipment manufacturers, founders, etc., of London, S.W.1. He was 67.

Mr. GEORGE BELL, who was general secretary of the General Federation of Trade Unions from 1938 to 1953, has died aged 80. A trade unionist for 55 years, he was national organizer of the friendly society which later became the National Union of Foundry Workers.

The death occurred on February 18, at the age of 89, of Mr. TOM ROBERTS, a director of William Roberts & Sons, Limited, Phoenix Foundry, Hibson Street, Burnley. He was the youngest son of the late Mr. William Roberts, the founder of the firm. Mr. Roberts had been active in the business until about two years ago.

Mr. WILFRED EDWARD YOUNG, a director of Yarrow & Company, Limited, engineers and shipbuilders, of Glasgow, from 1933 until his retirement in December, 1956, has died on the eve of his 73rd birthday. Mr. Young joined the company in 1910. Three years later he was appointed outside engineering manager, and during the first world war was responsible for the manufacture of diesel machinery for submarines. In 1920 he was placed in charge of the company's land boiler department.

Sooty at Bradford Works Club

"Sooty,"—a television puppet—with the assistance of Mr. Harry Corbett, last week knocked over a pile of pennies at the sports and social club of Hepworth & Grandage, Limited, founders and engineers, Bradford. The pennies, thought to be worth between £60 and £70, were then handed over to representatives of Dr. Barnardo's Homes.

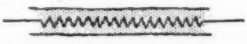
Electrical Aids in Industry *Data Sheet* **No. 4**

Resistance Heating – 1

In this form of heating, the heat is produced by passing an electric current through a high resistance conductor which is termed the "heating element".

The heat is transferred from the heating element to the work by convection, radiation or conduction or by a combination of any, or all, of these. When it is a question of radiation or convection, the element can be a bare wire or strip of suitable material, provided it is adequately supported on electrical insulation capable of withstanding the temperature.

When there is to be contact between the work and the element, heat being transferred to the work by conduction, the wire or strip must be surrounded by suitable insulating material and enclosed in a protective sheath.



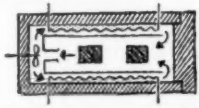
In the majority of cases, the wire or strip forming the heating element is made of a nickel-chromium alloy which has a high electrical resistance and can be safely used in air at temperatures of up to 1050°C., or in a suitable atmosphere, of up to 1150°C. Other element materials are available for use at higher temperatures.

Electric resistance heating may profitably be put to many diverse uses; two of these are described briefly below, others will be listed in a subsequent data sheet.

Furnace Heating

Electric resistance furnaces can be divided into two main categories, batch type and continuous. In most cases, the heating elements are of nickel-chromium alloy, for furnace temperatures up to around 1050°C., but higher temperatures, up to nearly 3000°C., can be obtained by using other metals or alloys, or in some cases non-metallic elements. A protective atmosphere is desirable to prolong the life of some of these higher-temperature elements. For all temperatures, electric resistance furnaces can be constructed so that the heating process takes place in a controlled atmosphere if this is dictated by the composition or heat requirements of the work charge. In some furnaces, fans are used to circulate the air or special atmosphere over the charge, thereby giving increased heating rates and a uniform temperature over the whole charge.

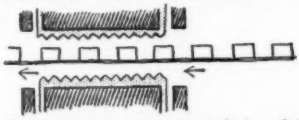
Automatic temperature control and programme control of the heating process are readily effected.



Electric furnaces are extensively used in industry, for example in the general heat treatment of metals, in the glass and ceramics industries, for brazing and sintering, and for many other applications requiring temperatures above 500°C.

Oven Heating

There are two basic forms of heat transfer used in electric resistance ovens; convection and radiation. The latter is dealt with in a separate data sheet under the heading "Infra-Red Heating".



Convection ovens may again be of the batch or continuous type. In either case, the charge is heated mainly by the movement of hot air, which is sometimes assisted, as in furnaces, by fans to give a rapid and uniform temperature rise. Ovens are normally designed for temperatures of up to about 500°C., and the heating elements are invariably of nickel-chromium or nickel-chromium-iron alloy.

Ventilation, when required, can be provided and regulated entirely to suit the heating process. Temperatures and times are readily controlled. A vacuum can be maintained in suitably designed ovens to assist in the extraction of moisture and solvent.

Convection ovens are extensively used for drying, baking and stoving operations, and for a host of other processes requiring a low or medium temperature.

For further information, get in touch with your Electricity Board or write direct to the Electrical Development Association, 2 Savoy Hill, W.C.2.

Excellent reference books on electricity and productivity (8/6 each, or 9/- post free) are available—"Induction and Dielectric Heating" is an example; "Resistance Heating" is another.

E.D.A. also have available on free loan a series of films on the industrial use of electricity. Ask for a catalogue.

6780/4

Personal

Mr. A. C. CORBETT and Mr. A. J. WATNEY have been appointed directors of N. Hingley & Sons, Limited.

Mr. C. N. GALER has been appointed general manager and elected to the board of Rootes Motors (Canada), Limited.

Mr. F. W. POWELL and Mr. E. L. O'FLANAGAN have resigned from the board of Hale & Hale (Tipton), Limited.

Dr. N. W. MURRAY, senior research assistant in mechanical engineering, has resigned from the staff of Sheffield University.

Mr. ANTHONY HAMPTON, chairman of C. & J. Hampton, Limited, toolmakers, Sheffield, is on a business visit to South Africa.

Mr. R. G. B. CRITTALL has been appointed a director of the Crittall Manufacturing Company, Limited. Mr. C. E. ROGERS has resigned from the board.

George Kent, Limited, Luton, announce that following the recent retirement from active duty of Mr. J. HORRIDGE on medical grounds, Mr. J. F. WILLSHER has been appointed general works manager.

Chamberlain Industries, Limited, have appointed Mr. E. J. H. HEWETSON, M.I.MECH.E., of 9, Roger Drive, Sandal, Wakefield ('phone Wakefield 5514), to represent its hydraulic side in the Yorkshire area.

Mr. H. G. STAGE and Mr. F. TOMPKINS have been appointed directors of Nu-Swift, Limited. Mr. Stage has been overseas marketing manager since 1952, and Mr. Tompkins has been home sales manager since 1954.

Prof. P. V. DANCKWERTS, of St. John's College, Cambridge, Professor of Chemical Engineering Science at the Imperial College of Science and Technology, has been elected Shell Professor of Chemical Engineering from October 1 in succession to Prof. T. R. C. FOX, who has resigned.

THE EARL OF HALSBURY has been invited by the directors of Lancashire Dynamo Holdings, Limited, to join the board of the company as vice-chairman in April, by which date the Earl of Halsbury will have relinquished his appointment with the National Research Development Corporation.

Mr. HARRY HUNTER, who has accepted the post of honorary curator of the Newcastle Municipal Museum of Science and Industry, is a former managing director of the North Eastern Marine Engineering Company, Limited, Wallsend-on-Tyne. Mr. Hunter retired from the managing directorship in 1956, but continues as a director and technical consultant to the company.

Mr. W. G. MAINWARING, formerly deputy hot mills manager of the Steel Company of Wales, Limited, has been appointed sheet mills manager to replace Mr. J. H. LYSAGHT, who has found it necessary to relinquish the position for health reasons. Mr. Lysaght has joined the sales organization as chief technical representative for the development of sheet-steel markets.

Mr. E. J. VIDLER, a director and general manager of W. T. Henley's Telegraph Works Company, Limited, who has been elected chairman of the Cable Makers Association, joined Henley's in 1918. He was appointed assistant sales manager in 1937 and sales manager in 1946. In 1950 he was appointed assistant general manager and became general manager in 1954. Mr. Vidler joined the board in 1955. He is also a director of Southern United Telephones, Limited.

Mr. N. C. MACDIARMID, managing director of the Stanton Ironworks Company, Limited, and a member of the executive committee of the Joint Iron Council, has been elected chairman of the Council of Iron Producers in succession to Sir FREDERICK SCOPES, who relinquished office last December. The Council of Iron Producers, representing the makers of foundry pig-iron, and the Council of Ironfoundry Associations, are the two constituent bodies of the Joint Iron Council.

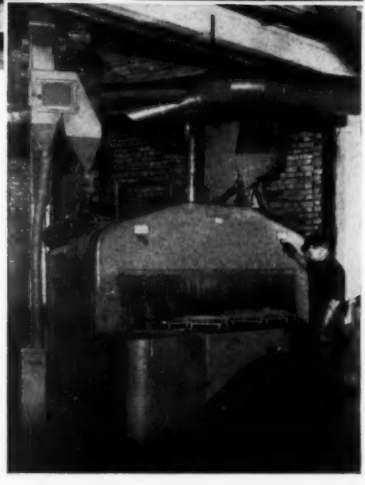
Mr. W. G. REYNOLDS, vice-president, and Mr. JOHN H. MCCONNELL, general counsel, have been elected executive vice-presidents of the Reynolds Metals Company, US. The president, Mr. R. S. Reynolds, jnr., states that the new positions reflect the expansion of the company's operations and the outlook for further expansion in the aluminium industry. Mr. R. S. Reynolds was recently elected to the board of British Aluminium Company, Limited, with Sir Ivan Stedeford, chairman of Tube Investments, Limited.

Three directors of the Workington Iron & Steel Company retired on February 28, from the board of that branch and from the boards of the other subsidiary companies of the United Steel Companies, Limited, of which they are members. They are Mr. J. N. ST. GEORGE CURWEN, Mr. LANGTON HIGHTON and Mr. D. R. WATTLEWORTH. Mr. T. SANDERSON, general works manager, and Mr. J. LAIRD, commercial manager, of the branch, have been appointed members of the board of the Workington Iron & Steel Company.

Mr. RALPH CREDLAND, joint managing director of Widnes Foundry & Engineering Company, Limited, since 1951 has retired. He became a director in 1939 and was responsible for the reorganization of Widnes Foundry & Engineering shortly after it was taken over by Thos. W. Ward, Limited. Although retiring from active duties Mr. Credland will remain on the Widnes Foundry & Engineering board in a consultative capacity. Mr. ALBERT WHITFIELD, a director of the company, has been appointed general manager from March 1.

Mr. W. H. MCFADZEAN, who has been industrial leader and vice-chairman of the Advisory Council on Middle East Trade since it was set up by the President of the Board of Trade in February, 1958, is retiring temporarily from this post, at his own request, consequent on his becoming president-elect of the Federation of British Industries. Pressure of work in his new capacity has obliged Mr. McFadzean to ask to be released from his ACMET duties during his term of office with the FBI. During this period Mr. H. G. NELSON has agreed to take over as industrial leader and vice-chairman of the Council. Mr. Nelson will visit the Middle East in his new capacity early this month. He will be accompanied by Mr. K. E. MACKENZIE, executive secretary to ACMET.

Mr. H. W. LOWNIE, JR., research metallurgist at Battelle Memorial Institute, Columbus, Ohio, has been awarded a gold medal award by the American Foundrymen's Society for "outstanding contributions to the Society and to metallurgical progress." His rôle in grey cast-iron research was particularly cited by the AFS in making this award, the John H. Whiting Medal for 1959. Chief of Battelle's process metallurgy research division, Mr. Lownie has participated in and guided studies of properties, applications and production of grey and malleable iron, and steel castings, and contributed to research on other metallurgical processes and materials. Author of over 25 articles on metallurgical processing, he earned a B.S. degree from Purdue University and an M.S. from the University of Pittsburgh. He is active in the American Society for Metals, American Institute of Mining, Metallurgical, and Petroleum Engineers, American Foundrymen's Society, and the American Society for Testing Materials.



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Raw Material Markets

Iron and Steel

Production of castings at the ironfoundries is maintained at recent levels, with some of the light foundries continuing to receive more business, particularly from the domestic utensil trade. Demands for domestic equipment have increased considerably, and some of the foundries catering for this trade are now doing better than for a long time past. The light foundries catering for other trades are not so well placed as in the case of those supplying builders' castings, the call for which remains disappointing, but should improve with better weather. Makers of high-phosphorus pig-iron have benefited to some extent by the improvement in trade, but not so much as expected, as increased quantities of scrap are being utilized by the foundries at the expense of pig-iron. There is very little change in the trading position at the jobbing and textile foundries, all of which are in need of more work.

Outputs of high-duty castings from the engineering and speciality foundries are maintained at appreciable levels. Current business at the foundries supplying the motor-car industry is up to recent levels, but from the machine-tool trade orders for castings show little sign of picking up. Fairly good orders for castings are being received from the engineering and allied trades, heavy electrical and power plant manufacturers, and many other users including collieries, steelworks, etc. The call for low-phosphorus iron is fairly good and enables most producers to dispose of the major portion of their makes. All grades of pig-iron, however, are plentiful and most, if not all, producers could increase appreciably on present deliveries, as in many instances production is well below capacity.

The steelworks continue to receive adequate consignments of basic pig-iron both for consumption and stock requirements, and a number of furnaces now out of blast or on reduced outputs could step up supplies if required. Similarly, other grades of pig-iron, production of which, on account of heavy stocks at the furnaces, has been curtailed so as to balance outputs with demands more evenly, can be obtained in increased quantities when the need arises. The foundries are cautious in their buying and continue to carry little stock, as any urgent requirements can be fulfilled from stocks held at the furnaces. Export merchants continue to endeavour to send additional tonnages abroad, but orders are difficult to secure against very keen competition.

The re-rollers continue to work hand to mouth so far as orders for their products and demands for steel semis are concerned. There is little improvement in their position, with the call for small bars and light sections at a low rate. Short-time working is general and difficulty is experienced in obtaining sufficient tonnage to maintain this reduced level of production. Plentiful supplies of steel semis are available from home steelworks.

Non-ferrous Metals

The copper price in London has been edging towards higher levels over the past three weeks and at the beginning of this week stood at roughly £240 a ton—the point it previously attained before the settlement of the labour strike in Chile. Strikes in Chile and the US have pushed the London price up considerably this week. Yet, the undertone still leaves much to be desired and the market has drawn most of its strength from America where demand has been consistently strong. The most disquieting feature, perhaps, has been the weekly increase in stocks. This has been a key point for rallying or discouraging sentiment and until stocks are once more trending downwards the present quotation seems high enough.

However, special factors have always played a specially significant role on the prices of non-ferrous metals and the current state of unrest in the Rhodesian Federation could well push the quotation higher. On the other hand, there seems no stopping the US price and the custom smelters are now quoting 31 cents with the producers still clinging to 30 cents a pound. A full cent gap between the two prices may not make economic sense to the producers so that a ½ cent rise in their quotation cannot be ruled out completely.

Tin is the metal which has been in the spotlight most often recently and the price has now gone above £780 a ton, allowing thereby the buffer stock manager to sell metal from his stocks, which are estimated at 23,350 tons. The persistent increase in the quotation has been the result of good buying from America and from the East with the UK and the Continent exhibiting satisfactory interest. The important point about the present position is that the buffer stock manager has sold all the tin hoarded in the Special Fund, which has been estimated to contain about 5,000 tons. This leaves the way clear to dispose of metal from the buffer stock and with demand buoyant and producers unable to raise their production sights until April—and then by only a total of 3,000 tons—the buffer stock manager should be able to reduce his holdings without adversely affecting the market. In the United States the price has now risen to around $1.05 cents a pound.

Lead has been a poor market on both sides of the Atlantic for many months past and the reduction in the US price to 11 cents a pound was not unexpected. Indeed, the surprise is that the quotation was maintained at its previous level for so long. In London the quotation reached the lower resistance level of £70 a ton and there is still nothing in the outlook to indicate that the price will do much more than fluctuate around its present level of £71. In the US stocks are also high and there is ample metal about to satisfy all forseeable demand.

Zinc, being a much better market than lead over these past months, managed to hold its price level better. But inevitably the hard facts of ample supplies, lack of barter deals and over production brought the price down to 11 cents a pound last week. The UK market is, however, insulated from the US market by the import quotas and the price has not suffered despite the US reduction. Demand continues to be generally satisfactory in the UK and on the Continent.

Index to Vol. 105

The index to the JOURNAL, volume 105, covering the period July to December, 1958, has now been printed and is available to readers free of charge. Applications for copies should be addressed to the publishing office, FOUNDRY TRADE JOURNAL, John Adam House, John Adam Street, Adelphi, London, W.C.2. Subscribers who wish to receive copies of indices automatically as they are printed may apply for inclusion on a permanent mailing list. Those already on this list should not need to apply for their current copy.

T. R. DOWSON & COMPANY, LIMITED—Mr. George Young, general manager, has been appointed managing director as from April 1. He joined the company in 1935 and was made general manager in 1949.

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Current Prices of Iron, Steel, and Non-ferrous Metals

(Delivered unless otherwise stated)

March 4, 1959

PIG-IRON

Foundry Iron.—No. 3 IRON, CLASS 2: Middlesbrough, £21 6s. 0d.; Birmingham, £20 18s. 3d.

Low-phosphorus Iron.—Over 0.10 to 0.75 per cent. P, £23 17s. 0d., delivered Birmingham. Staffordshire blast-furnace low-phosphorus foundry iron (0.10 to 0.50 per cent. P, up to 3 per cent. Si), d/d within 60 miles of Stafford, £24 1s. 3d.

Scotch Iron.—No. 3 foundry, £25 3s. 6d., d/d Grangemouth.

Cylinder and Refined Irons.—North Zone, £25 19s. 0d.; South Zone, £26 1s. 6d.

Refined Malleable.—P, 0.10 per cent. max.; North Zone, £27 6s. 6d.; South Zone, £27 9s. 0d.

Hematite.—Si up to 2 per cent., S. & P. over 0.03 to 0.05 per cent.: N.-E. of England (local iron), £25 6s. 6d.; Scotland (Scotch iron), Zone S.1, £25 13s. 0d.; Sheffield, £26 15s. 0d.; Birmingham, £27 4s. 0d.; Wales (Welsh iron), £25 6s. 6d.

Basic Pig-iron.—£20 3s. 0d., delivered Staffs, Derbyshire, Notts, Lincs, Rutland, Northants, and Leics.

FERRO-ALLOYS

(Per ton unless otherwise stated, delivered)

Ferro-silicon (6-ton lots and over).—45 per cent. Si, £41 0s. 0d. to £43 10s. 0d., scale 15s. 0d. per unit; 75 per cent. Si, £56 10s. 0d. to £60 10s. 0d., scale 15s. 0d. to 16s. 0d. per unit.

Ferro-vanadium.—50/60 per cent., 22s. 6d. per lb. of V.

Ferro-molybdenum.—65/70 per cent., carbon-free, 12s. 10d. per lb. of Mo.

Ferro-titanium.—20/25 per cent., 2-3 per cent. Cu, £250 0s. 0d.; 38/40 per cent., commercially carbon-free, £287 0s. 0d.

Ferro-tungsten.—80/85 per cent., 7s. 11d. per lb. of W.

Tungsten Metal Powder.—98/99 per cent., 10s. 11d. per lb. of W.

Ferro-chrome (6-ton lots and over).—4/6 per cent. C, £77 0s. 0d. to £81 0s. 0d., basis 60 per cent. Cr, scale 26s. 0d. to 27s. 6d. per unit; over 6 per cent. C, £74 10s. 0d. to £77 10s. 0d., basis 60 per cent. Cr, scale 26s. 0d. to 27s. 6d. per unit; 2 per cent. C,* 1s. 7½d. to 1s. 10½d. per lb. Cr; 1 per cent. C,* 1s. 8d. to 1s. 11d. per lb. Cr; 0.15 per cent. C,* 1s. 9d. to 2s. 0d. per lb. Cr; 0.10 per cent. C,* 1s. 9½d. to 2s. 0½d. per lb. Cr; 0.06 per cent. C,* 1s. 9½d. to 2s. 0½d. per lb. Cr.

Metallic Chromium.—98/99 per cent., 6s. 10d. per lb.

Metallic Manganese.—94/96 per cent., carbon-free, £255 0s. 0d.; 96/98 per cent., £285 0s. 0d.

Ferro-columbium.—65/72 per cent., Cb + Ta, 19s. 9d. per lb., Cb + Ta.

Ferro-manganese (home).—78 per cent., £73 0s. 0d.

SEMI-FINISHED STEEL

Re-rolling Billets, Blooms, and Slabs.—BASIC: Soft u.t., £32 15s. 6d.; tested, 0.08 to 0.33 per cent. C, £33 15s. 6d.; hard (0.41 to 0.60 per cent. C), £34 17s. 0d.; silico-manganese, £43 16s. 6d.; free-cutting, £36 14s. 6d. SIEMENS MARTIN ACID: Up to 0.25 per cent. C, £41 1s. 0d.; silico-manganese, £44 4s. 0d.

* Average 68-70 per cent.

Billets, Blooms, and Slabs for Forging and Stamping.—Basic, soft, up to 0.33 per cent. C, £38 10s. 0d.; basic hard, over 0.41 up to 0.60 per cent. C, £39 12s. 6d.; acid, up to 0.25 per cent. C, £43 4s. 0d.

FINISHED STEEL

Heavy Plates and Sections.—Ship plates (N.-E. Coast), £42 2s. 0d.; boiler plates (N.-E. Coast), £44 12s. 0d.; floor plates (N.-E. Coast), £43 11s. 0d.; angles (N.-E. Coast), £39 16s. 6d.; joists (N.-E. Coast), £39 12s. 6d.

Small Bars, Sheets, etc.—Rounds and squares, under 3 in., and flats 5 in. wide and under, untested soft basic, 50 tons and over, £40 0s. 6d.; under 10 tons to 4 tons, £40 18s. 0d.; under 4 tons to 2 tons, £41 3s. 0d.; hoop and strip, coils, £39 0s. 0d.; uncoated strip mill coils, hot rolled, under 3mm. to 12g., £44 16s. 0d.; black sheets (hand mill), 24g., £58 14s. 6d.; galvanized corrugated sheets, 24g., £67 10s. 0d.

Alloy Steel Bars.—1 in. dia. and up: Nickel, £68 10s. 0d.; nickel-chrome, £99 11s. 0d.; nickel-chrome-molybdenum, £111 19s. 0d.

NON-FERROUS METALS

Copper.—Cash, £246 0s. 0d. to £246 10s. 0d.; three months, £245 15s. 0d. to £246 0s. 0d.; settlement, £246 10s. 0d.

Copper Tubes, etc.—Solid-drawn tubes, 2s. 3½d. per lb.; rods, 261s. 6d. per cwt. basis; 20 s.w.g., 296s. 6d. per cwt.

Tin.—Cash, £779 10s. 0d. to £780 10s. 0d.; three months, £782 10s. 0d to £783 10s. 0d.; settlement, £780 10s. 0d.

Lead (Refined Pig).—First half March, £71 0s. 0d. to £71 5s. 0d.; first half June, £72 7s. 6d. to £72 10s. 0d.

Zinc.—First half March, £75 15s. 0d. to £76 0s. 0d.; first half June, £74 0s. 0d. to £74 5s. 0d.

Zinc Sheets, etc.—Sheets, 15g. and thicker, all English destinations, £110 12s. 6d.; rolled zinc (boiler plates), all English destinations, £108 7s. 6d.; zinc oxide (Red Seal), d/d buyers' premises, £95 10s. 0d.

Brass Tubes, etc.—Solid-drawn tubes, 1s. 10½d. per lb.; sheets to 10 w.g., 202s. 0d. per cwt.; wire, 2s. 8½d.; rolled metal, 202s. 0d. per cwt.

Brass (Brazing).—BS1400, B3 (65/35), £155; B6 (85/15), £200.

Brass (High Tensile).—BS1400, HTB1 (30 tons), £195; HTB2 (38 tons), — ; HTB3 (48 tons), — .

Gunmetal.—BS1400, LG2 (85/5/5/5), £195; LG3 (86/7/5/2), £205; G1 (88/10/2/½), £261; (88/10/2/1), £247.

Phosphor Bronze.—BS1400, PB1 (AID released), £287 per ton.

Leaded Phosphor Bronze.—BS1400, LPB1 (1060), £210 per ton.

Phosphor Bronze Strip, etc.—Strip, 294s. 0d. per cwt.; wire, 4s. 1½d. per lb.; rods, 3s. 4¾d.; tubes, 3s. 4¾d.; chill cast bars: solids 3s. 4¼d.; cored 3s. 5¼d. (CHARLES CLIFFORD, LIMITED.)

Nickel Silver, etc.—Rolled metal, 3 in. to 9 in. wide × 0.056, 3s. 9¾d. per lb.; round wire, 10g. in coils (10 per cent.), 4s. 2¾d.; special quality turning rod, 10 per cent., ½ in. dia., in straight lengths, 4s. 1¾d. All prices are net.

Other Metals.—Magnesium, ingots, 2s. 3d. per lb. Antimony, English, 99 per cent., £190 0s. 0d. Quicksilver, ex-warehouse, £74 0s. 0d. Nickel, £600 0s. 0d. Aluminium ingots, £180 0s. 0d.; aluminium bronze (BS1400), AB1, £231; AB2, —

Hurst, Nelson to Close ?

Motherwell manufacturers of railway rolling stock and component parts, Hurst, Nelson & Company, Limited, has announced that it may have no alternative but to close its works and pay off all its employees when present orders are completed. In that event nearly 300 workers will be affected in an area where unemployment is already running at the rate of 9.4 per cent.

Mr. Russell Bailey, managing director of Charles Roberts & Company, Limited, Wakefield, which took over Hurst, Nelson & Company last year, said: "We regret that conditions in the railway-wagon-building industry have deteriorated very quickly, and we have no inquiries of any magnitude outstanding for railway wagons at the present time. The British Transport Commission desired to bring the railways up to date at the earliest possible moment and, finding that the old-established builders such as Hurst, Nelson could not possibly give the desired speed of delivery, decided to bring new sources of supply into an industry which, over the past 60 years, has generally been capable of providing more trucks than normal obsolescence made necessary.

"The recession in the home coal trade and iron and steel trades has unfortunately meant that the additional numbers of new steel wagons thus provided are not at the present time, we understand, fully employed, and, as a matter of fact, the railway employees are now complaining very bitterly, and very naturally, that they are short of work in their own railway wagon building shops.

"Coupled with this is sharply increasing competition from many other countries throughout the world who have now recovered from the effects of the war, and the further fact that many countries which were traditional British markets now manufacture their own stocks. Although we can accept no responsibility for this unfortunate state of affairs, we have discussed with the staff and workpeople a basis of some compensation for them in relation to their years of service."

In a statement, south-west division officials of the AEU deplore the situation in view of assurances which were given when the company was taken over by Charles Roberts & Company. An AEU official said it was "another example of an English firm buying out a rival and closing a Scottish works."

Export of Iron and Steel Scrap

At the request of the Ministry of Power, the Board of Trade announces that arrangements have been made permitting the export of compressed baled iron and steel scrap, not exceeding an f.o.b. value of £25 per ton, and of iron and steel scrap turnings and borings not exceeding an f.o.b. value of £25 per ton until June 6.

An open general licence will be issued permitting export of this material to any destination during the period March 8 to June 6, inclusive.

Inquiries about these licences should be made to the Board of Trade Export Licensing Branch, Gavrelle House, Bunhill Row, London, E.C. (telephone: MONarch 4071). Copies of the open general licence (2d. each, by post 4d.) will be obtainable from the Stationery Office, Kingsway, W.C.2, and branches.

Traders are reminded that the current open general licence which permits the export of most kinds of iron and steel scrap comes to an end on March 7.

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Book Reviews

Foundry Noise Manual—a report published by the American Foundrymen's Society, Golf and Wolf Roads, Des Plaines, Illinois. Price $4.75. Obtainable from the Penton Publishing Company, Limited, 2, Caxton Street, London, S.W.1, UK. (Price to AFS members 27s. 6d.; non-members 32s. 6d.; postage extra).

This 50-page manual combines the various aspects of industrial noise—legal, medical, scientific and engineering—into a publication which will be of value, not only to the foundry industry but to all who are interested in the fight against one of the world's most unnecessary evils. It covers the physiological and medical effects on workers of exposure to excessive noise, as well as the techniques of noise measurement and control. The chapter on "Engineering Control of Noise" is particularly informative, giving practical solutions to a wide range of foundry noise problems. Photographs of actual installations are included together with octave-band analyses of the noise attenuation to be expected.

The manual is well indexed and referenced and has also a glossary of terms amongst which one may find words such as "cerumen" (ear wax) and presbycusis (natural loss of hearing), as well as most of the more common acoustical terms. There is, not unnaturally, an American bias throughout, for example, a list is given of instruments for measuring noise, and these are all of American manufacture, similarly some of the references quoted may be difficult to obtain in this country, but this does not detract seriously from what is a very authoritative, up-to-date publication on a subject which is still growing in importance.

R. H. PLATT.

Vacuum Metallurgy—a series of lectures. Edited by R. F. Bunshah. Published by Chapman & Hall, 37, Essex Street, London, W.C.2; price £5 net.

The foreword to this book states that vacuum-process treatments have added a new "dimension" to the science of metallurgy and that they constitute a fast-moving field." The detailed practical information on this subject given at the recent symposium of the Iron and Steel Institute—much of which is not given in this volume—indicates this speed of development. These treatments are obviously a most important aspect of metallurgy which must be seized and appreciated not only by the academically minded, but by those who have the responsibility for laying out large sums of money on plant and development.

The present work consists of a planned series of 27 lectures, given in New York University during 1957 by American, European and Soviet technologists. There is no paper by a British author but on page 139 it is learnt that the vacuum-arc-melting capacities of two British firms are higher than all the other West-European firms put together. A 29th chapter on electron-bombardment techniques is the text of a further lecture delivered in 1958. The lecture plan was to range from reports on vacuum equipment, through processes, to applications and the result is a valuable and detailed volume. It is completed by a sectionalized bibliography of 23 pages and short author and subject indexes. The printing and illustrations are excellent, and a general picture is given of the art as it was in 1957.

As a basis for most of these vacuum processes, a straightforward theoretical treatment of thermodynamics and kinetics is provided which occupies 62 pages of text. Here is the justification for academic training in leading to the realistic practical results of to-day. Vacuum systems and "trouble-shooting" are also dealt with. Then come sections dealing with melting by arc, electric induction and electron-bombardment techniques. Degassing of metals in the liquid and solid states is fully described, and since many hydrides, nitrides and oxides can be made to dissociate, non-metallic inclusions are thereby removed.

The founder will be much attracted to chapter 13 on the production of cast shapes by vacuum-induction melting: turbines, buckets and vanes of high-purity alloys are used in the "as cast" condition. Most of them are made by lost-wax investment-casting processes but unfortunately the reader will not find any illustrations or details of the moulds. In chapter 21 on high-temperature alloys, a comparison is made of mechanical tests on cast and wrought products and in one alloy at least the castings have longer rupture lives. This author concludes that much has been expected from the vacuum-melting process "and some have been pleased and others disappointed."

The last section entitled "Future Trends" remarks that through this "welter of activity" (a) gas-turbine alloys have 80 deg. C. higher working temperatures thanks to vacuum-induction melting, (b) vacuum-arc furnaces have produced improved turbine-disc material and (c) vacuum degassing of liquid steel "seems to have eliminated" hairline-crack effects. This last remark has already passed into history, for it is now known that this particular process is effectively established. If nature abhors a vacuum it is clear that in this respect many metallurgists will have to be unnatural.

H. O'NEILL.

Proceedings of the Institute of Vitreous Enamellers, Vol. XII (covering the years 1954 to 1957). Published on behalf of the Institute by Industrial Newspapers, Limited, 17-19, John Adam Street, London, W.C.2. Price to non-members on application to the Institute's secretary, Mr. John D. Gardom, Ripley, Derbyshire.

This volume contains an account of two annual meetings and the second international enamelling congress, plus 20 selected technical papers. Amongst the latter are quite a number of foreign origin. The enamelling of cast-iron ware does not loom so large as in the earlier days of the Institute, but the account of a Danish works does show that there is still a field for really high-class enamelled cast-iron goods. This too is borne out by the success of certain British and Swedish enamelled cast-iron ware of good design. The *Proceedings* also includes an article by a French author on de-enamelling. Altogether it is a well-produced book which for long will be used as a reliable work of reference.

House Organ

Nickel Bulletin, January 1959. Issued by the Mond Nickel Company, Limited, Thames House, Millbank, London, S.W.1.

Abstracts of papers printed in this issue deal with non-ferrous alloys, physical and magnetic properties, and the influence of nickel content of copper-alloys on susceptibility to intergranular cavitation; high-strength steels; and heat- and corrosion-resisting materials. The latter relate, *inter alia*, to literature on the structure and properties of nickel-containing high-temperature alloys and steels, erosion- and corrosion-resistance of materials to steam generated by nuclear power-plants, and prevention of stress corrosion. The *Bulletin* also contains the first of the quarterly reviews of recent patent literature.